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Five hoodoos of conglomerate capped with sandstone stand on the rugged hillside of Deadman's Valley, west of Kamloops, British Columbia. These pillars were formed by the erosive action of wind and rain, and their height of some fifty feet from the base may be gauged by the girl standing below. It requires keen eyesight to see the pillars from the road and a steep climb to reach them on the baked hillsides.

Richard Harrington

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Editor - WILLIAM J. MEGILL

CONTENTS

SEPTEMBER 1960 ✦ VOLUME LXI ✦ NUMBER 3

COVER SUBJECT:—*An attractive spot for camping and fishing on the Campbell River, British Columbia.*
Canadian Government Travel Bureau

	Page
TEEMING WATERS *by MARK F. RONAYNE*	78
INDUS WATER FOR PAKISTAN *by R. C. HODGES*	96
IN QUEST OF LORD BALTIMORE'S HOUSE AT FERRYLAND *by J. R. HARPER*	106
EDITOR'S NOTE-BOOK	V
AMONGST THE NEW BOOKS	VI

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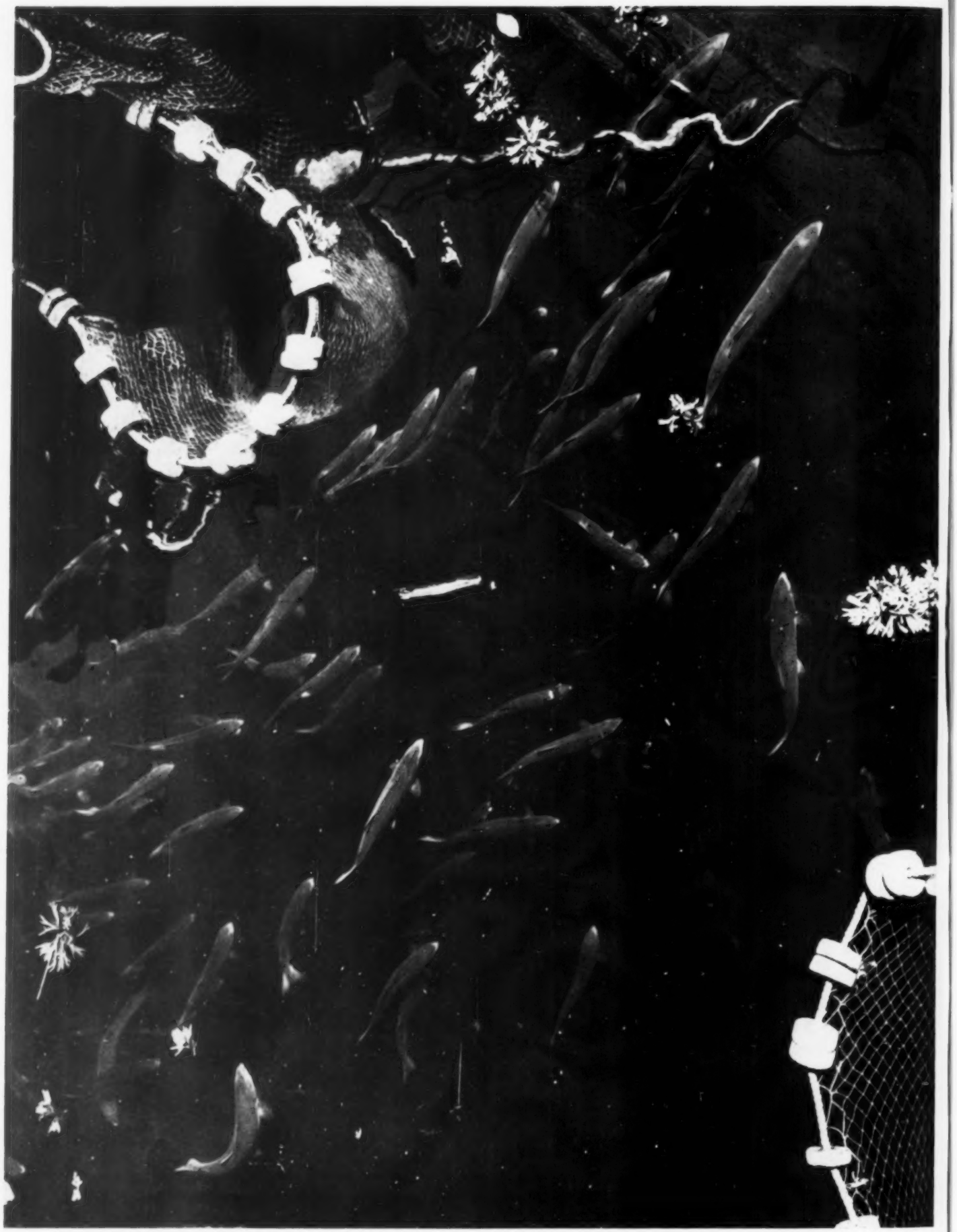


Salmon are the most important of the Pacific Coast fish species. Here, salmon enclosed in a purse seine are brought closer together as the huge net is drawn in.

Teeming Waters

by MARK RONAYNE

Photographs by the Department of Fisheries of Canada except where credited.

WHEN IN 1957 huge trawlers lowered their nets into the Atlantic off Canada's east coast to bring up copious catches of redfish from hitherto unfished waters, history had once again come full cycle in repeating itself. For, as early as 1497, the year of Canada's discovery, it was being said of the waters of this new world:

"The sea is full of fish which are taken not only with the net but also with a basket in which a stone is put so that the basket may plunge into the water . . . "

Today, after four and a half centuries, notable changes have come over the fisheries off our east coast, in the species sought, the ships that pursue them and in the catching methods. But one factor remains unchanged — from the earliest days of discovery to the present, the wealth of these waters continues to be a prize coveted by fishermen of many European as well as the two North American nations, and food from these teeming waters continues to follow multilaned routes to many parts of the globe.

Richly endowed as she is on the east coast, Canada is no less fortunate in the resource of her Pacific waters. Here, too, are found the requisites of a great natural heritage replete with variety, quality and abundance. Based on the all-important salmon, the west coast fisheries also have access to important stocks of halibut, herring and various groundfish and shellfish species which support a rich and multi-faceted industry.

Rounding out the picture of Canada's fisheries are those of the immense stretches of inland lakes and rivers which comprise over one-half the freshwater area of the earth. The inland fisheries are widely dispersed over the central and prairie provinces and today are reaching ever farther into the northland.

From these vast resources of ocean, river and lake, offering some 150 species of fish and shellfish of commercial importance, Canada's 80,000 fishermen annually harvest two billion pounds for which they receive upwards of $100 million. From the catch, the processing industry, employing some fifteen thousand men and women, produces a wide variety of food items in fresh, frozen, salted, pickled, canned, smoked and other forms, together with an imposing list of by-products comprising chiefly animal feeds and industrial oils, all having a marketed value of some $200 million. The United States, with which Canada shares fisheries on both her coasts and in some of the Great Lakes, is Canada's principal customer, but many other countries, principally in the Caribbean, South American and European theatres together with the Far East and Commonwealth areas, also represent important markets.

Atlantic Fisheries — Inshore

The fisheries along Canada's Atlantic seaboard are shared by five provinces: Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island and Quebec. From Grand Manan, New Brunswick, in the south to Cape Chidley at the northern tip of Labrador, including the deep indentations of hundreds of bays, coves and inlets, the protruding headlands and offshore islands, the entire shoreline stretches some 12,000 miles. Some sections of this long, crooked seaboard are thickly dotted with fishing hamlets and major ports. Other areas, notably in Labrador, find settlements thinly strewn out, and often these are inhabited by only a handful of families. But throughout the entire coastline, whether densely or sparsely populated, the fisheries play an important part in the people's way of life, providing them with a major or partial share of their sustenance. And from the little and big ports a myriad fleet of dories, motorboats, long-liners, trap-skiffs and draggers put out to reap the wealth of the coastal waters.

Dominant among the species taken by the inshore Newfoundland fishermen is the cod which swarm into coastal waters during the summer months to feed on vast schools of silvery little capelin which come in to the beaches to spawn. A large proportion of the

Drying salt cod on flakes in Nova Scotia.
Nova Scotia Film Bureau

cod catch is taken in set trapnets; additional quantities are caught on baited trawl and hand lines. At one time the entire Newfoundland cod catch was processed in the salted and dried form, but since the 1940's a substantial portion has been utilized by the rapidly expanding quick-freezing industry.

Other species taken in Newfoundland's coastal waters include: Atlantic salmon, herring, mackerel, turbot and squid. Only two shellfish species are harvested, lobsters along most of the coastline and scallops in a relatively limited area on the province's west coast.

A colourful and hazardous inshore operation is the hunting of pothead (pilot) whales by fishermen of a few east coast villages. The whales, travelling in herds, are surrounded by the fishermen in small boats and driven into the shallows of a cove where they are slaughtered by hand harpoons. The meat of the potheads is used in producing feed for furbearing animals while the fat is rendered into oil.

Danish seining, a long-proven method among European fishermen but relatively new to Canada, was pioneered in Newfoundland in the early 1950's and met with moderate success in a few areas, notably in the south coast sector of Fortune Bay. This

Here, off the coast of Ingonish, N.S., fishermen haul aboard a catch of mackerel.

The sardine industry of southern New Brunswick relies heavily on weirs such as the above for supplies of the immature herring. Photo shows how the weir is seined, the fish being brought together in a mass and taken into the boats.

fishery for small flatfish is the only exclusive operation for fish of this category in the island.

As in Newfoundland, the majority of fishermen in the Maritime provinces — Nova Scotia, New Brunswick, Prince Edward Island — and Quebec are employed in the inshore fishery. Throughout most of this huge area, which takes in the Gulf of St. Lawrence, the Bay of Fundy and numerous large bays, there is seasonally a great variety and abundance of fish and shellfish. The groundfish species, those living on or near the bottom, are well represented with cod, haddock, pollock, hake and different kinds of flatfish, these being supplemented by so-called "estuarial" species such as salmon, alewives, smelt and shad.

Fishermen of the Maritimes combine a mixture of skills and fishing devices in their day-to-day operations, using long-lines, small otter trawls, fixed gill-nets, trap nets and hand lines. The Danish seine method of fishing has taken hold in some areas, following experimental fishing with this gear by the federal Department of Fisheries, and is conducted mainly in Gulf of St. Lawrence waters between Cape Breton and the Magdalen Islands.

A delight of the gourmet as well as the everyday meal planner are the shellfish caught throughout most of the Maritimes region. By far the most important of these is the lobster, taken in all four provinces, which has the distinction of being the most important income producer of all species in Maritimes waters. In fact, the value of the lobster catch in the Atlantic region as a whole equals that of all the cod taken by east coast Canadian fishermen in both inshore and deepsea waters.

Lobsters are caught in traps made of wood lathes and twine set in close-to-shore depths of up to 20 fathoms. Because of fishing intensity and their high vulnerability to overfishing, lobsters are rigidly protected as to fishing seasons which vary throughout the lobstering district. The federal Fisheries Department also carries out an intensive cam-

A fisherman removes his lobster catch from a trap.
Nova Scotia Film Bureau

Using rake-ended, scissors-like tongs, these Ellerslie, P.E.I., fishermen bring up oysters from a Malpeque oyster bed.

The old and new methods of harvesting clams.

paign against the taking of young lobsters ("shorts") and "berried" lobsters, i.e., those carrying eggs.

Oysters, a valuable crop, are fished both from public beds where they grow "wild", and from leased beds which are under cultivation. Prince Edward Island is one of the main producers of cultivated oysters, and the name Malpeque stands for an epicurean treat. In 1954-55 oyster stocks of New Brunswick and adjoining Nova Scotian grounds were seriously thinned out by an epidemic disease (harmless to humans), which caused severe hardship to fishermen in those areas. After close scientific study of the problem the federal Department of Fisheries initiated a program to rehabilitate the depleted beds by re-seeding with immune oysters from Prince Edward Island, and predictions are that the grounds will be restored to their previous productivity in half the time it would take under natural recovery.

Clams are another important shellfish in many parts of the Maritimes and are usually dug or raked. Stocks in deeper waters inaccessible to hand-diggers can now be exploited too as the result of the development of a mechanical clam digger by the Fisheries Research Board of Canada.

Among the most abundant of pelagic

Spanish pair trawlers at dockside in the harbour of St. John's, Nfld. These and other ships of the international fleet fishing the Grand Banks often seek shelter or take on supplies at St. John's.

species in the Maritimes are herring which are caught in weirs, gill-nets and purse seines. Much of the catch is canned or cured for food purposes and additional large quantities are used in the reduction industry and for bait. The important sardine canning industry of southern New Brunswick relies for supplies on immature herring taken principally in the Bay of Fundy in weirs. Herring also have a special significance for the sandy, windswept Magdalen Islands which stand out in the Gulf of St. Lawrence. For the fisherfolk there, this species constitutes the bulk of their landings.

Several other species of varying importance are caught by commercial fishermen of the Maritimes area. These include mackerel, which are taken almost everywhere, and others of regional rather than general importance.

Offshore — The Grand Banks

Since the early 1500's European fishermen have roamed the northwest Atlantic in search of cod and seldom, if ever, have their campaigns gone unrewarded. In fact, so phenomenally productive are the 200,000 square miles of deep-sea grounds that today's fishing pressure is more intense than at any time in the past.

"It's like Main Street on Christmas Eve", is the way one veteran bluewater Canadian fisherman is wont to describe the banks during the height of the fishing season. By night the scene is especially impressive as the amber islands of light move slowly across the vast ocean void, ever fishing. Here assemble the last great ocean-going schooner fleet, the dory fishers of Portugal who come out under taut sails as they have for upwards of four centuries. Today their fleet also includes

"Sworders" leaving Glace Bay, Cape Breton, Nova Scotia, for fishing grounds.
Nova Scotia Bureau of Information

many otter trawlers dragging huge, cone-shaped nets across the bottom, and mingling with similar ships from France, Italy and Spain. The Spanish also ply the banks in another type of craft, small pair-trawlers which tow one otter trawl between them, and which are dwarfed by the giant factory ships wearing the colours of the United Kingdom and the U.S.S.R.

In the past few years Icelandic and West German trawlers have also frequented these grounds, as have long-liners from Norway and the Faroe Islands. For the crews of this huge international fleet such names as the Grand Bank, St. Pierre Bank, Banquereau, Green, Middle Sambro, Sable Island, Browns and LaHave and other "banks" are as familiar as those of their streets at home.

Fished for cod since their earliest days of discovery, these rewarding underwater plateaux have in recent years been contributing other food species in massive volume to the world's tables including haddock, pollock, halibut, hake, redfish and a mixture of flatfish. Despite the intensive scouring over the centuries, the banks continue to offer new fishing lodes such as the untapped redfish stocks discovered a few years ago and now exploited by at least five nations.

Although far outnumbered by the international fleet Canadian fishing vessels are among the most active on the banks, benefiting from the close proximity of this great food reservoir. This aspect of our fisheries has witnessed a striking change in the past quarter-century as the picturesque banking schooners, with few exceptions, sailed into obsolescence to be replaced by a fleet of fast, efficient trawlers.

Another important offshore fishery is for scallops, mainly on Georges Bank off the Gulf of Maine. These grounds are fished extensively by Canadian and United States fishermen and produce by far the bulk of this shellfish landed in the Maritimes. Within recent years new scallop grounds have been found by Canadian fisheries scientists on the southern part of St. Pierre Bank which are said to be sufficiently extensive to support commercial operations.

Swordfishing, in which well over 100 boats engage, may also be classed as a deepsea operation although the fish are taken on the surface. The "broadbills", which average 200

Aerial photograph of a seal herd on the ice-floes off Newfoundland.
Spartan Air Services

Otter trawling on the Grand Banks off Canada's east coast. This vessel is well fished with haddock.

The cod trap is a favourite catching gear among Newfoundland fishermen. Here the trap has been "dried up" and the fish are being taken aboard the trap skiff.

Salmon being brailed aboard a purse seiner off the B.C. coast. This type of vessel is the largest in Canada's Pacific operations for the valuable salmon.

pounds but individually often weigh up to 600 pounds, are captured by hand harpoons. Such a harpoon, equipped with an electrically charged head, has been proven successful in killing swordfish quickly and efficiently.

Daring and danger are epitomized in the sealfishery out of Newfoundland and Nova Scotia ports in the waning days of winter and early spring. Two species of northern seals, the harps and hoods, are hunted in sturdy, iron-prowed motor vessels along the Arctic icefloes on which the mammals whelp. Prime quarry of the hunters are the "whitecoats", the young of the species, which command premium prices because of their hair-fast pelts and higher grade of oil extracted from the blubber.

Sealhunting is a gruelling but exciting pursuit, fraught with peril from drifting icebergs, "growlers" and rafting ice among which the vessels thread precarious paths seeking a payload. In the early days more than 400 sailing ships were outfitted for the sealfishery each year out of Newfoundland ports but today the fleet has dwindled to a fraction of that number, sailing out of Halifax, N.S., and St. John's, Nfld. The decline of the sealhunt is attributed to a falling off in the market price for marine oils.

The two main sealing grounds are the "Northern Front", off Newfoundland's northeast coast, and the Gulf of St. Lawrence. In addition to the shipboard operation, landsmen also take varying numbers when drifting ice brings the seals within striking distance from shore.

Pacific Fisheries

When the first white pioneers arrived on the Pacific Coast they found that fish, in this case salmon, had from some unknown time been a prime factor in the livelihood of the native Indian tribes, with many villages located close to choice river fishing sites. To this day the salmon species — sockeye, coho,

pink, chum and spring — dominate the British Columbia fisheries in value, but the present highly-mechanized industry exploits many other fish and shellfish as well.

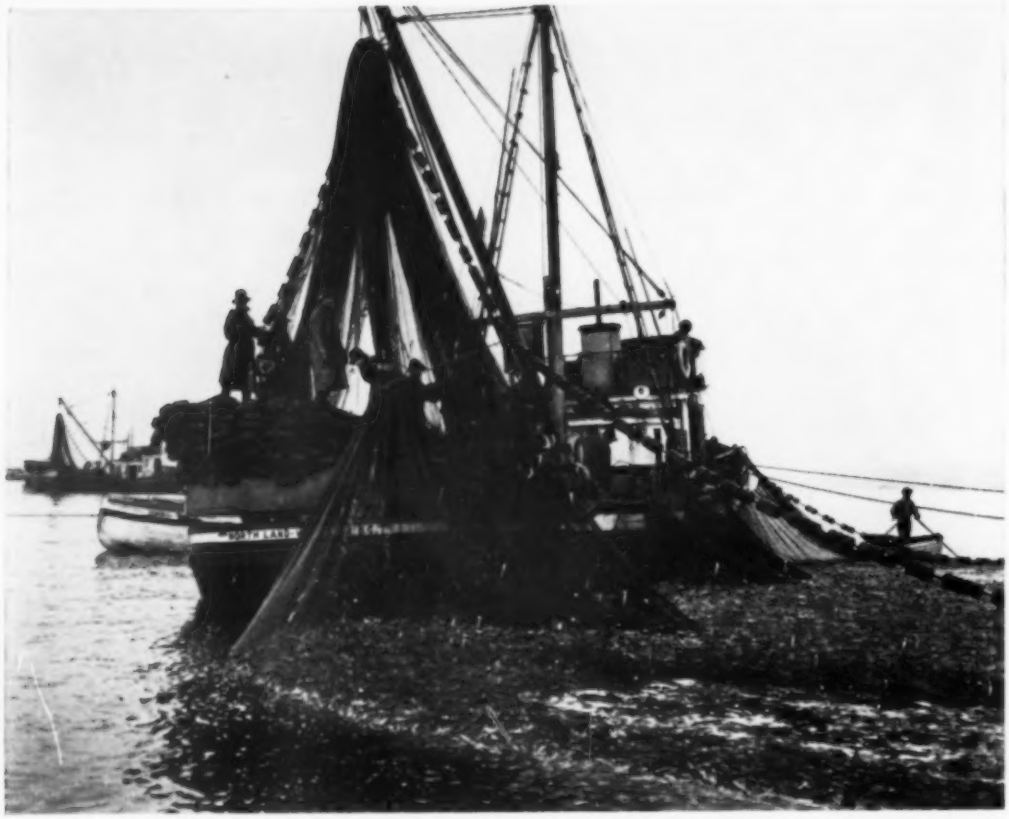
Notable after salmon are the halibut stocks, the largest on this continent, and the herring which habitually outrank in volume the combined catch of all other species on our Pacific Coast. Most of the West Coast fishing activity is carried on in waters close to shore or sheltered by the chain of large islands which act as a natural breakwater against the ocean's turbulence along much of the British Columbia coast. The principal offshore fishery is for halibut on the prolific grounds in the Gulf of Alaska and the Bering Sea.

From the earliest times the sockeye has been the most highly prized of the salmon species; however, as processing and preserving techniques have improved, the fishing industry has made good use of the other species as well. By far the greatest part of the overall catch is canned in which form it is marketed throughout Canada and in many countries abroad, with the United States ranking as our best customer. Varying but important quantities are also processed in the fresh form and as frozen, smoked and dry-salted.

The salmon are taken in coastal and estuarial waters when they make their annual pilgrimage from the ocean to spawn in British Columbia's rivers and streams. This fishery is a highly concentrated one, with something new being added almost every season, in vessels and catching equipment, to make operations more efficient. Salmon traps, once numerous, have decreased to the point where there are now only five in operation, at the southern tip of Vancouver Island. In their place the industry has developed fast-moving fleets of gill-netters, trollers and purse seiners which compete intensively for the great salmon runs. One of the most important developments in catching gear in recent years is the power block for purse seiners which, by eliminating most of the arduous hauling of the huge net by hand, has given this gear added speed and efficiency.

Largest boats of the British Columbia salmon fleet are the purse seiners which get their name from the huge net in which the fish are taken. This net may be up to 220 fathoms in

A British Columbia gill-netter hauling his net for salmon.



(Left) A Pacific Coast purse seiner takes a large haul of herring. The net is hauled in by a recently developed power block.

(Right) A small salmon troller cruises slowly over sparkling Pacific waters.

length and is buoyed by floats at the surface. After the net has been set out to encircle the fish, a purse line running through the bottom meshes is drawn taut and the net is gradually taken aboard the ship until the fish are brought to the surface in a mass. They are then brailed into the boat with a huge, winch-operated dipnet. Gill-netters, the smallest units of the fleet, are also the most numerous. Their net of fine, strong twine is suspended

Catching salmon for research in the Pacific, sponsored by the International Pacific Salmon Commission. The salmon are tagged and released to continue their journey to the spawning beds.

between corks at the head and leads at the bottom, with one end tied to a buoy and the other attached to the boat. Fish become trapped when they swim into the mesh and are caught by the gills. The third type of salmon catcher, the troller, is somewhat larger than the gill-netter, and is immediately identified by its tall poles. These extend over the sides when the boat is fishing, and the fish are caught on metal lures ("spoons") attached to stainless steel lines running out from the poles.

At one time the fisherman carried his catch to market or to the processing plant and some still do when this is convenient. However, to meet the exigencies of a rapidly developing industry there has evolved a tightly-organized sea-borne transportation system employing collecting boats and packers which speed a large part of the catch to the processing plants.

Pacific salmon are justly regarded as a quality product for which the demand, both on the domestic market and abroad, consistently remains high. For this reason they are intensively exploited, and, to avoid their being over-fished, the various populations are protected by regulations covering catching gear, and seasons designed to provide escapement of sufficient spawning stock to ensure adequate seeding.

In their freshwater habitat the salmon may face hazards in the form of natural and man-made obstacles, predatory enemies, pollution of streams by industrial wastes, or floods and droughts caused by indiscriminate removal of forest cover from the stream banks. Here further protection is provided by the federal Department of Fisheries which by stream

British Columbia shrimp fishery. The catch is hand-brailed from cod end.

General view of Seton Creek dam with fishway on the right bank.

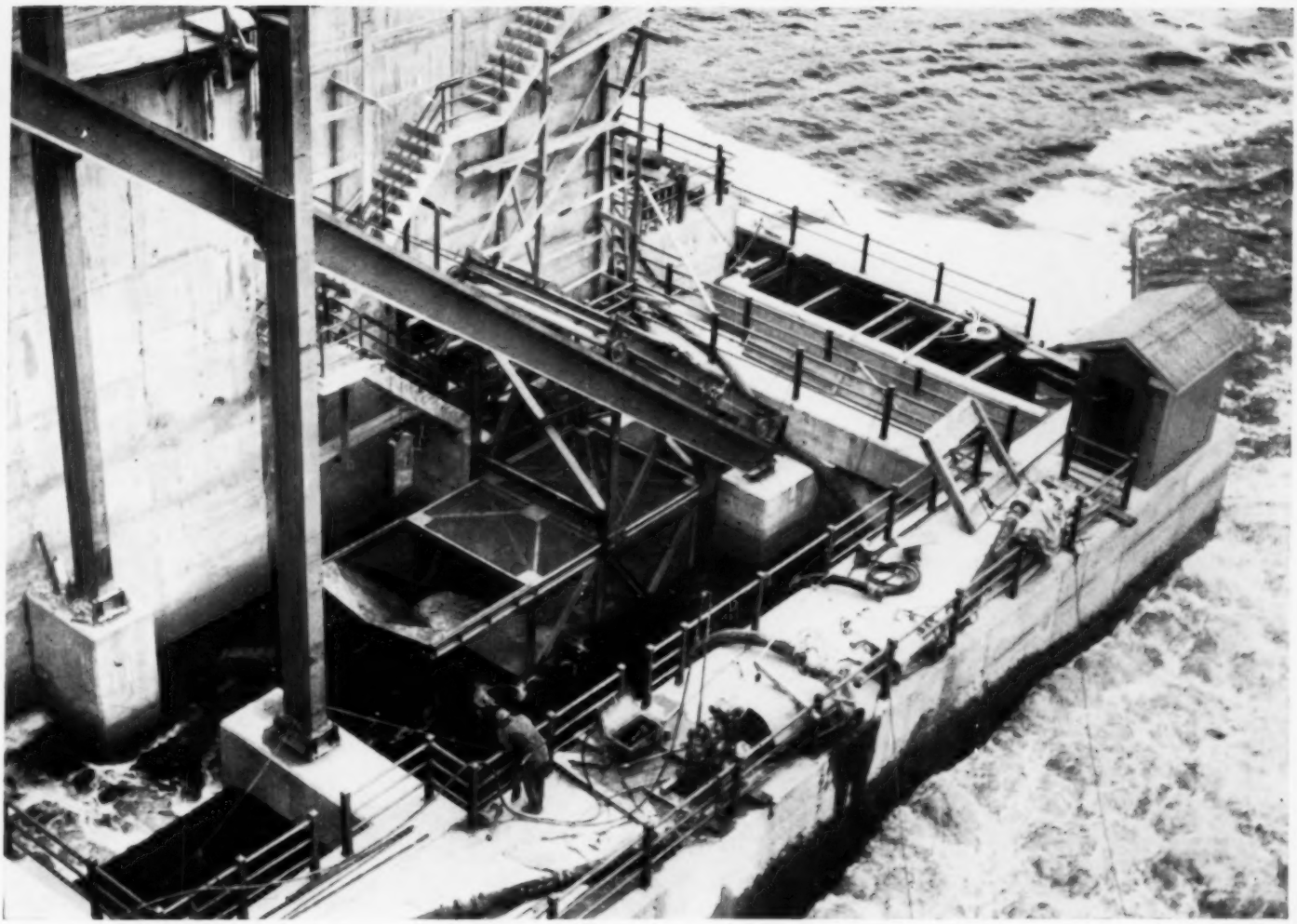
The Hells Gate fish ladders on the Fraser River aids the return of spawning salmon runs to this river system.

clearance programs, the building of fishways and by other remedial measures, seeks to preserve and enhance the salmon's spawning and early-life environment. So thorough has been this work that runs of salmon threatened with extinction have been successfully restored, and man-made spawning beds are bringing new stocks into existence.

Halibut and Other Species

Similar rigid protection is provided for the halibut and herring stocks, both of which are avidly pursued by the west coast industry. A case in point was the serious decline in halibut stocks which led to an agreement, in 1923, between Canada and the United States aimed at reviving them. Under a system of quotas the halibut grounds have become even more highly productive than at any previous time. Halibut are caught by the long-line method and are marketed as fresh or frozen.

Pacific herring, caught in purse seines, are also hedged by a protective quota system established and enforced by the federal Fish-



Beechwood Dam, St. John River, New Brunswick. Skip-hoist-fish-lift in trapping position.

eries Department. These stocks, too, continue to flourish and support the province's important oil and fish meal industry.

Adding variety to the Pacific catch are such groundfish as gray cod, lingcod, sablefish, soles and mixed flounders. Among the shellfish species crabs and oysters compete for supremacy while clams, shrimps and prawns also contribute a share to overall landings.

Two other species of fish which have made fleeting contributions to the British Columbia fisheries are the pilchard and tuna. During the late '30's the pilchard stocks, in their migration northward along the Pacific Coast, were caught in large enough quantities to produce up to 15,000 tons of meal and four million gallons of oil. However, since 1940 this fishery has fallen off and is today but a memory.

Tuna have proven to be similarly mercurial in their visitations to the West Coast. In the late 1940's as much as two million pounds were landed annually, and in subsequent years hopes have sometimes been

Fishway on the big falls on Newfoundland's Terra Nova River.

A swirl of smoke clouds the harpoon fired at a humpback whale off the British Columbia coast. Air is pumped into the captured whale to keep it afloat until the "catcher" boat arrives to tow the whale to the factory.

raised of a return of this good fishing, but invariably the tuna have failed to appear.

Whaling was at one time a major activity on both of Canada's coasts, but because of declining markets for products of this fishery it now plays but a minor role. The only fishery in recent years for large whales, apart from a few taken in Newfoundland, was conducted in British Columbia but this year (1960) it was announced that, even there, the lone existing station would not be operating.

Inland Fisheries

For most Canadians the multitude of lakes, rivers and streams from coast to coast are mainly a holiday retreat. But there are thousands of others for whom the nation's 260,000 square miles of freshwater area are as much a commercial fishing territory as are the oceans for the saltwater fisherman.

Over 600 lakes are commercially fished but the major share of landings, understandably, comes from the larger and more accessible areas. Among these the principal producers are the Great Lakes, notably Lakes Erie and Huron, Great Slave Lake in the Northwest Territories, Lakes Winnipeg, Winnipegosis, Manitoba and The Pas in Manitoba, Athabaska Lake in Saskatchewan and Lesser Slave Lake in Alberta. New roads knifing into wilderness areas are gradually bringing previously inaccessible sources into range.

Ontario ranks as the largest fresh fish producer followed in order by Manitoba, Saskatchewan, Alberta and the Northwest Territories. Principal species according to volume are whitefish, perch, pickerel, lake trout, herring, pike, suckers, sauger, and smelts.

Practically all the summer catch is made with gill-nets and trap nets which the fishermen work from a heterogeneous fleet tuned to local requirements. These range from canoes and simple rowboats to the unique, closed-in fishing tugs of the Great Lakes. For fishing through the thick, winter ice the fishermen use an ingenious device called the "jigger" to set their nets under the ice.

Inland fishing is replete with its hazards and hardships ranging from the sudden, violent storms of the Great Lakes to the benumbing cold of sub-zero temperatures in the northern areas. Writing of the lot of the win-

ter fisherman, a federal Fisheries official pictures them graphically:

"Often far out on the ice, out of sight of land, in the milky twilight of the short winter day, with the temperature many degrees below zero and in the face of cutting winds, the fisherman hauls his long string of nets with wet hands, and laboriously takes the tangled fish from the meshes. Since fresh fish, not frozen, bring the best prices, if he can he covers his catch with snow, believe it or not, to prevent freezing, as soon as it lands on the ice."

From the icy wastes much of the winter catch starts on its journey to market in a "bombardier", a tank-like tracked vehicle with a heated body, or in aircraft. In cases where the fish has been frozen many fishermen still use dog teams and others use tractors and trucks. Over a maze of water, land and air routes about 80 per cent of the entire catch from the far-flung inland fisheries goes to markets in the United States. The remainder, except for a small specialty portion, is absorbed by the domestic market.

As with the marine species, the freshwater catch is marketed in a variety of forms: dressed and whole, fresh, frozen and filleted. The highly regarded "Winnipeg Goldeye", which now come mostly from Ontario and Alberta are smoked, and others are frozen in blocks to be used eventually for certain specialty fish products appearing in glass jars.

Many of the inland areas are vulnerable to over-fishing and suitable safeguards have been devised to ensure productivity. However, some freshwater territories have peculiar problems for which new remedies must be prescribed. Such a complication was presented in the invasion of the Great Lakes by predacious sea lampreys following the building of locks and canals. In particular, they are regarded as being largely responsible for the diminution of whitefish and lake trout stocks in the lakes.

To meet this challenge, Canada and the United States have joined, in the Great Lakes Fishery Commission, in an all-out program to find ways of eradicating the sea lampreys. So far considerable success has been obtained by using electrically charged barriers to block the predators from their spawning streams,

Fishermen lifting pound net on Lake Erie, Ontario. A large variety of fish is taken from this and other lakes in Canada's vast freshwater areas.

A halibut fisherman takes in a big fish on his long-line.

and more recently a chemical has been developed which, when introduced into breeding streams, destroys the young lamprey but is harmless to desirable sport and commercial fish. The lamprey control program is to be followed by a program of re-stocking with trout to boost recovery of these stocks.

Another marine species which has thrived in the Great Lakes is the smelt which were transplanted from their ocean habitat to some lakes adjoining Lake Michigan as forage for the local species. In some way — whether through a broken dam or overflow — the smelt found their way into Lake Michigan, continued on through Lake Huron, and eventually arrived in Lake Erie where they flourished. In ten years the smelt populations have attained such proportions that they are now an important factor in the region's fishing industry. The bulk of the catch is taken in shallow waters when the fish congregate to spawn. This limits their availability to a relatively short period. To extend the fishing season for smelt, the federal Department of Fisheries is experimenting with gear which will take smelt in the lake's open waters and successful work has already been conducted with the mid-water trawl.

The Northern Resource

Any discussion of Canada's fisheries resource would be incomplete without a reference to the potential of the vast northern areas of ocean and inland waters. Historically, these resources have been exploited chiefly by the native populations for food purposes. A limited commercial fishery has for many years been based on the white whale herds, particularly in the Churchill area of Hudson Bay. These mammals are hunted with harpoons and guns, chiefly from small boats, and are protected by a catch quota. A relatively minor fishery for Arctic char has also been launched as one facet of the general development of the northland.

Without doubt the most important factor in the north's fisheries future is the scientific research program that is now being carried out. These investigations, which have been going on for years, have been intensified as a result of the increased attention focussed on the overall resources of the northern areas. There is a general feeling that this region has a fisheries potential as yet unexploited; success or otherwise in this regard will be revealed by the probing light of scientific research.

Inasmuch as they deal in a resource subject to influences over which little or no control can be exercised — one that is victim to vagaries of weather, current, temperature and other implacable laws of nature — Canada's fishermen bring a rare faith to their calling. For them a fishing season begins many months before a fish may be caught, with boats to be put in order, gear to be overhauled or replaced, shore installations to be built or repaired and a host of other details to be completed if their work is to succeed.

In the attainment of this goal the industry is aided immeasurably by the activities of the federal Department of Fisheries which, under authority of the Parliament of Canada,

is the official guardian of the resources of tidal and inland waters. Parliament has sole legislative jurisdiction over all the country's fisheries, but down through the years a number of provinces have been delegated administrative responsibility for their fisheries in lake and stream. An exception to this general rule is the Province of Quebec which also administers most aspects of its sea fisheries.

A major share of responsibility for the protection and nurturing of the fisheries resource is undertaken by the Department's Conservation and Development Service whose teams of highly trained biologists, engineers and protection officers carry out a multitude of tasks in the course of their everyday work. Theirs is also the job of applying the findings of the scientists of the Fisheries Research Board of Canada, the Department's scientific arm, whose achievements have won worldwide acclaim.

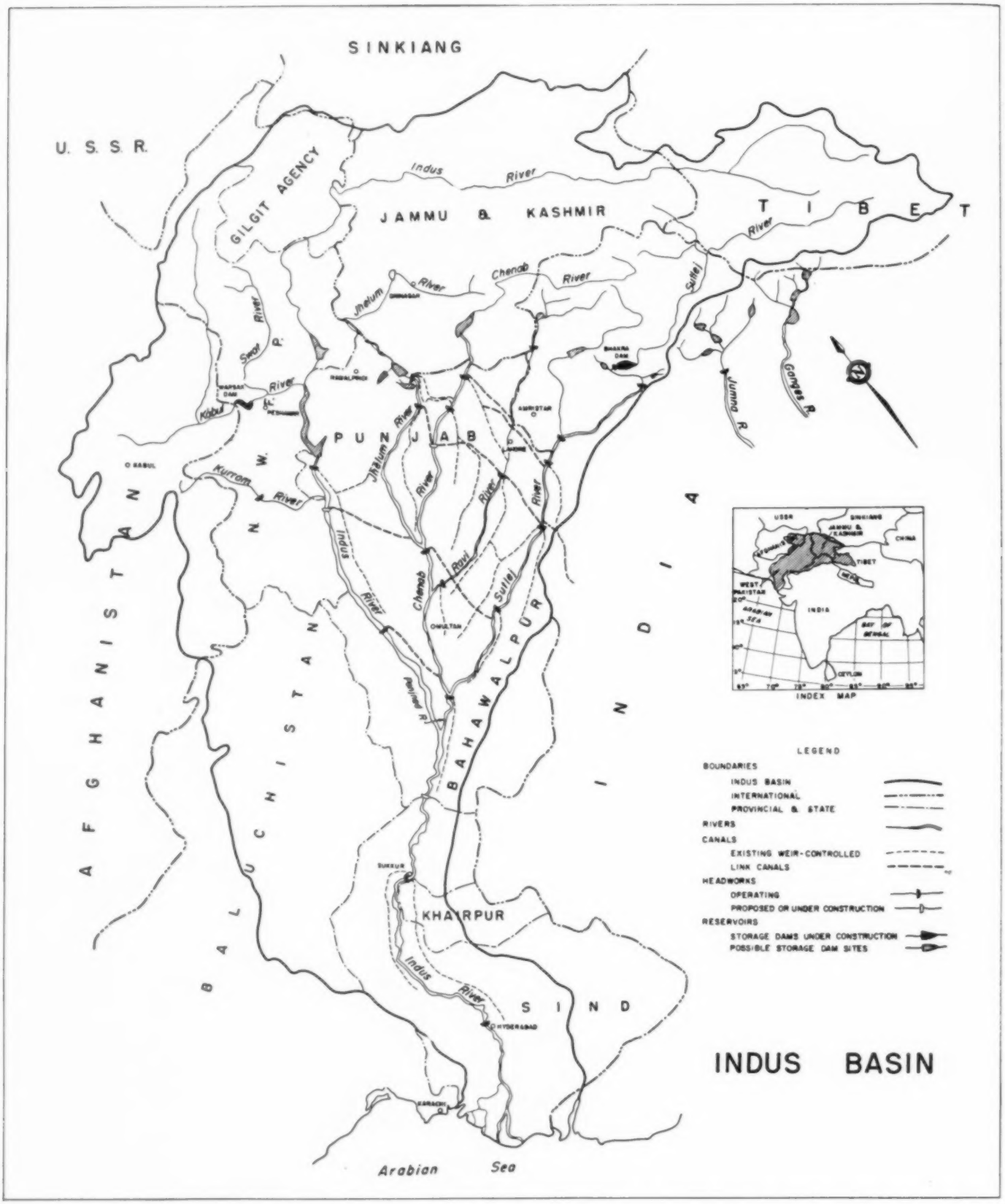
A high order of diplomatic and administrative ability is called for in dealing with problems associated with the international fisheries adjacent to our coasts. In the solution of such matters, Canada takes a leading role as signatory to seven international conventions covering fish stocks in which this country has an interest.

It is significant that the first international treaty of any kind which Canada signed in her own right was the halibut treaty with the United States in 1923. Two additional treaties of a bi-lateral nature with the United States cover the sockeye and pink salmon resource of the Fraser River-Juan de Fuca Strait on the Pacific and the jointly-shared fisheries of the Great Lakes.

Treaties of a broader nature include the International Commission for the Northwest Atlantic Fisheries in which twelve nations now participate; the International North Pacific Fisheries Commission in which Canada has as partners the United States and Japan; the International North Pacific Fur Seal Commission composed of Canada, Japan, U.S.S.R. and the U.S.; and the International Whaling Commission which is worldwide in membership.

Through these international groups, through various committees on the home front and by the concentrated efforts of its staff across the country, the federal Department of Fisheries seeks to preserve and expand Canada's rich heritage of ocean and inland waters for the benefit of today's population and for generations of Canadians to come.

Codfishing fleet, Gaspé Peninsula.
The boats find haven in this snug, picturesque harbour when storms brew.


SINKIANG
U. S. S. R.
GILGIT AGENCY
Indus River
JAMMU & KASHMIR
T I B E T
Jhelum River
Chenab River
Sutlej River
Ganges R.
Jumna R.
Swat R.
Kabul River
P U N J A B
Jhelum River
Ravi River
Chenab River
Sutlej River
Kurram River
Indus River
A F G H A N I S T A N
W
B A L U C H I S T A N
B A H A W A L P U R
I N D I A
KHAIRPUR
S I N D
Indus River
Arabian Sea
INDEX MAP
LEGEND
BOUNDARIES
INDUS BASIN
INTERNATIONAL
PROVINCIAL & STATE
RIVERS
CANALS
EXISTING WEIR-CONTROLLED
LINK CANALS
HEADWORKS
OPERATING
PROPOSED OR UNDER CONSTRUCTION
RESERVOIRS
STORAGE DAMS UNDER CONSTRUCTION
POSSIBLE STORAGE DAM SITES
INDUS BASIN

A citrus orchard on perennially irrigated land. The rectangular field pattern is characteristic of the modern canal colonies of the Punjab. Sugar-cane (A), clover (B), and harvested wheat (C) can be identified. In some fields, crop growth is affected by high salt concentration (S).

Indus Water for Pakistan

by R. C. HODGES

Photographs by the author except where credited.

PAKISTAN, a young yet venerable country, is about to commence the design and construction of the greatest irrigation project yet undertaken by man, while at the same time, continuing to operate uninterrupted, the world's most extensive irrigation system. India has a similar problem and plan but her part will be mentioned in this article only as it affects Pakistan.

Like many of man's great achievements throughout history, the need for this huge scheme was born in a period of strife and stress which more than once threatened the peace and security of both countries. With the partition of the Indian sub-continent in 1947, political boundaries were drawn across the old province of Punjab and therefore across the vast canal network of the Indus and its tributaries. Millions of people migrated across the new frontier to the accompaniment of bloodshed and large-scale privation. An agreement on the supply of water to the existing canals was signed by India and Pakistan in 1948, but the pressure of rapidly-growing populations soon indicated that a scheme to permit full utilization of the available potential water supply for irrigation and for generating hydro-electric power was essential to the economies of both countries.

The very name of this province—Punjab—epitomizes the important place that the Indus tributaries have held in the lives of the people since man occupied this fertile plain thousands of years ago. The older spelling, Panjnad (still found as the name of that stretch of river which carries the combined tributary waters to join the Indus) is a contraction of the Urdu words "panch" meaning five, and "nadi" meaning river—it is indeed "the land of the five rivers".

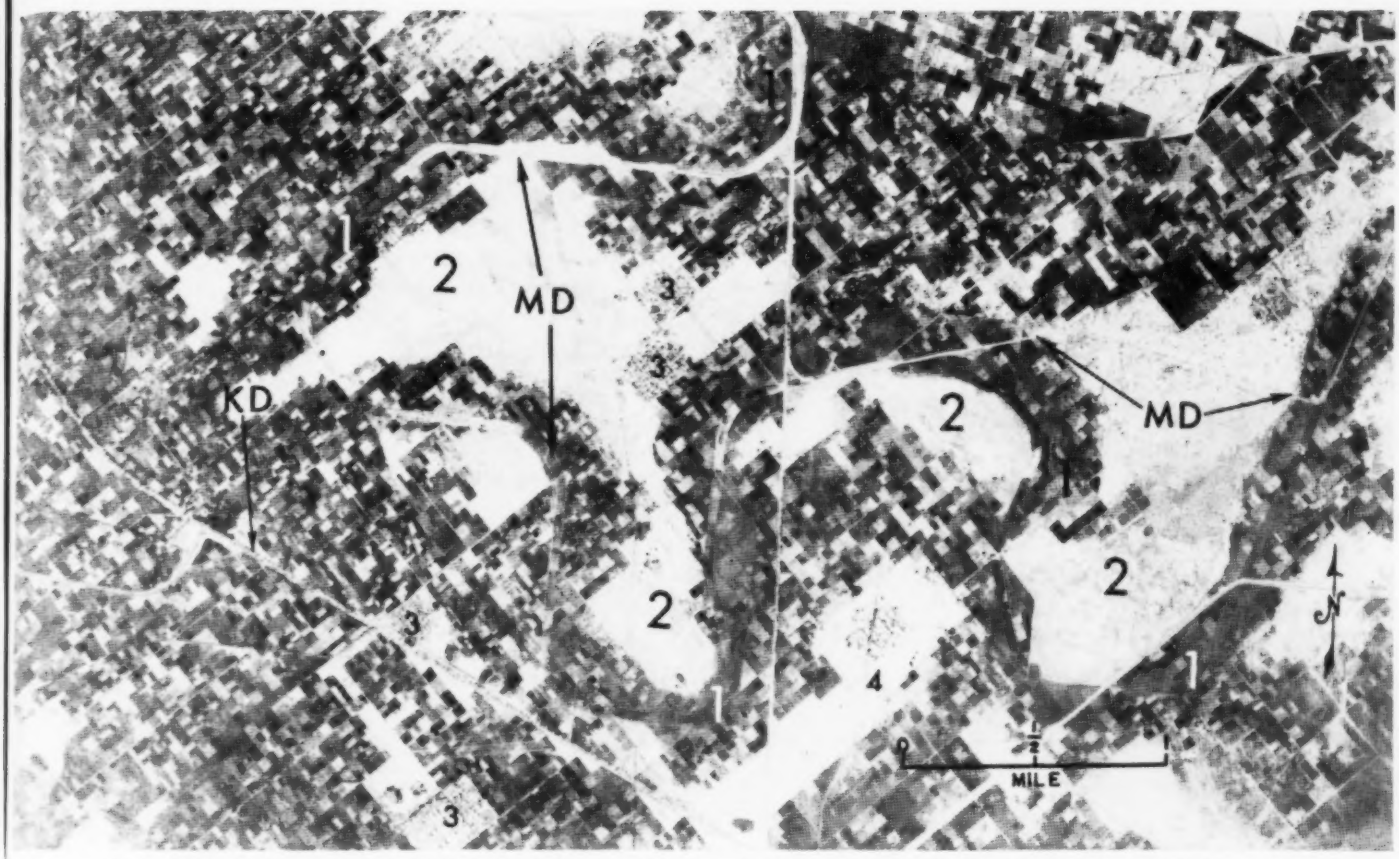
Modern development began about fifty to

An open scrub growth of Capparis aphylla. *This is the natural vegetation of much of the land before irrigation. The aridity is evident; rainfall in this area is 5 to 8 inches and highly variable.*

one hundred years ago, with the help of British engineers, and has continued since, until now irrigation systems deriving water from the Indus system of rivers command some 31 million acres of arable land in West Pakistan. Further substantial acreages are irrigated from the easternmost tributaries in Northwest India as well. Thus was the world's greatest irrigation system created, and the desert gradually subdued, providing food for the sub-continent's hungry millions.

The name "Indus" stems from the Sanskrit word for river, "sindhu". The Greeks corrupted the word to "India" and the Persians to "Hindu". No greater tribute could be paid to the value of a river than the perpetuation of its name in this fashion. The drainage basin of the whole system has an area of 372,000 square miles which provides an annual water yield of some 168 million acre-feet. Of this mean annual production, between 60 and 70 million acre-feet at present flow to the sea unused during the monsoon period. The Indus main rises in the high mountains of Tibet and flows westward for almost 1,000 miles before it changes course to a southerly direction; then it flows through Kashmir and West Pakistan, emptying into the Arabian Sea some 2,000 miles from its source. Although its length is one-half that of the famous Nile, its mean annual flow is 215 percent that of the Nile. It brings to the edge of the Indus plain, where irrigation begins 1,000 miles from Karachi, as much water as is discharged to the sea by the great Columbia River of the Pacific Northwest.

Both India and Pakistan have a number of problems, the presence of which has intensified the dispute between the two countries over the sharing of these waters. The most obvious one, of course, is the increasing demand for food and fibre to sustain their growing populations. Whether this is accomplished by higher yields from existing cultivated land or by bringing new land into production, more and more water is required. Both countries, too, have a tremendous urge to stabilize their economies and to increase wealth. The contribution of agriculture to this end must come not only through more production but through the elimination of crop failure; obviously ample water supplies, controlled and assured, are essential. An additional problem has been, and still



An aerial photograph of a typical landscape of the level interfluvial lands in mid-Punjab served by a perennial canal (KD). The surface is uniform, except for the prominent, ill-drained channel remnant (1) and its uncultivated slip-off slopes (2). The old channel bed serves as the route for a drain (MD). Note the rectangular pattern of fields and villages (3). Some of the uncultivated tracts are saline. Also shown are the rectangular blocks of common land near most villages (4) which were set aside for grazing, but are now bare of vegetation. Hunting Survey Corporation

remains, the accommodation of refugees and landless peasants. New canal colonies are the main hope for these unfortunate people, for the course of industrialization is inevitably slow.

More water is also required in the never ending struggle to reclaim lands that have gone out of cultivation because of salinity. Unfortunately, the majority of the irrigation systems were constructed without due regard to the need for drainage. A rising water-table plagues large tracts and is the primary cause of salinity. The drainage problem is being attacked and all extra irrigation water that can be spared during the flood season is used where possible to flush the excess salts from the saline soils. The production of hydro-electric power and the control of flooding are added dividends to be earned through the harnessing of the river system.

As the date of completion of the Bhakra Dam on the Sutlej river approached, it became apparent that India would soon be diverting most of the water of that river into irrigation systems within its territory. Already the cutting-off at the border of a few distributary canals in recent years had indicated that the Thar or Great Indian Desert was ready and waiting to reclaim the land won from it by much effort in the past. The fields of the affected farms show faintly in outline through the sand dunes which now march across the area.

The apparent inability of India and Pakistan to reach agreement on a long-term plan for sharing the Indus Basin waters led the International Bank for Reconstruction and Development to tender its good offices in 1951. The offer was accepted and the Bank has since 1952 held a long series of talks with both sides in the dispute. In 1954 the Bank made a proposal which has become the basis of all subsequent discussion and negotiation. In summary, this proposal was that India should be given the right to exclusive use of the waters of the three easternmost tributaries of the Indus. These are the Sutlej, Ravi and Beas Rivers. Pakistan would get exclusive

use of the waters of the "western rivers"—the Chenab, the Jhelum and the Indus itself. Certain minor uses of the upper reaches of these rivers would be reserved for the people of Kashmir.

The Bank has evolved a scheme to finance the very large costs of the engineering works and has received assurances from several countries of their willingness to contribute funds which would be in addition to those provided by Pakistan and India and by the Bank itself. The implementation of the project and the participation of these governments would of course be dependent upon the adoption of a Water Treaty by India and Pakistan in settlement of the Indus Waters dispute. The Treaty is based on the plan which was submitted to the two governments in 1954.

"The participation of each of the friendly governments concerned would be as follows:

A. In Foreign Exchange

Australia	£A	6,964,286 in grants
Canada	Can.	$22,100,000 in grants
Germany	DM	126,000,000 in grants
New Zealand	£NZ	1,000,000 in grants
United Kingdom	£	20,860,000 in grants
United States	U.S.	$177,000,000 in grants, and
	U.S.	$103,000,000 in loans.

B. Local Currency

United States	The equivalent of U.S. $235,000,000

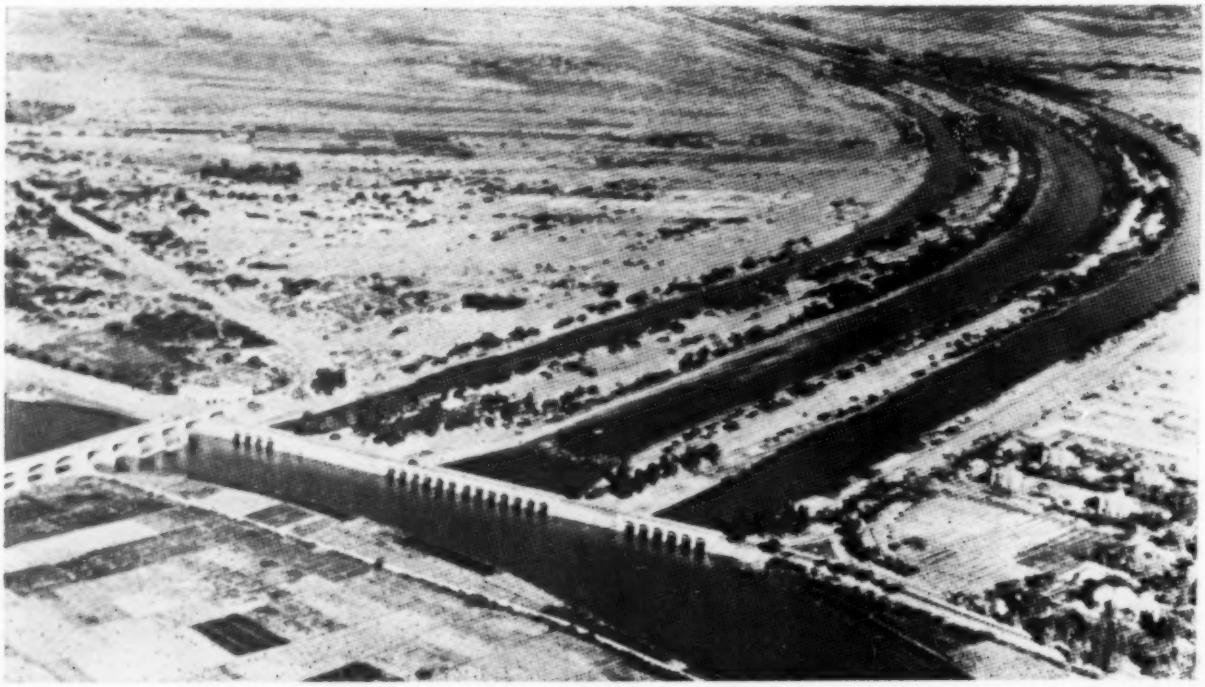
The president of the World Bank is prepared to recommend to the Bank's Directors that the Bank should participate with loans to India and Pakistan of the order of $103,000,000."

Even before "partition" there had been one casualty from among the five rivers, for the Beas, baby of the family, was diverted southerly into the Sutlej not far below its point of emergence from the mountains in northeastern Punjab. The old Beas channel remains as a prominent feature of the landscape, its bed a series of cultivated fields, and its banks a line of distinct bluffs which break the flatness of the plain.

Now the Sutlej and the Ravi, between which the Beas once flowed, will join it in oblivion and the active streams will be recognized in the future only as channel remnants, meandering through the farmland. However, they will still serve a useful and most necessary function in their retirement for they will begin a new career as drainage channels in a region plagued by poor drainage, high water-table and salinity.

The other two rivers of the original five, the Chenab and the Jhelum, along with the Indus main which skirts north and west of the Punjab, will supply the total irrigation requirements of West Pakistan. The waters of the Ravi, Beas and Sutlej will, through

The northern end of the Lloyd Barrage, showing the three canals leaving from the right bank of the Indus. Note the head-regulators. The cultivated land in the left foreground is an island, clearly seen in the aerial photograph on the next page. These canals carry water for a hundred miles to thousands of square miles of irrigated land.



The Lloyd Barrage at Sukkur. This vertical aerial photograph shows the advantageous location of the barrage. Near Rohri the Indus River cuts through a limestone ridge (R). Deflection of the river course into the valley of the Eastern Nara, which lies just east of the ridge is prevented by a series of large artificial embankments (1). At the barrage (2), three large canals flow from the river on its north bank; two large canals and two small canals flow from the river on its south bank. The head-regulators, 66 in number and each with a 60 foot span, can clearly be seen. Note the ill-drained and saline lands (3) and the groves of date palms (4) on the south bank of the river. Hunting Survey Corporation

total diversion, serve India's thirsty soil. It is obviously essential to replace the water of the three southern streams so that the farms in Pakistan now dependent on their flow will not perish. Thus Canada, the United States, India, Britain, Australia, New Zealand and West Germany will include in their foreign aid budgets large sums to add to those of Pakistan in order that the "Indus Links" may be constructed. These carrier canals will divert water, now running to the sea, from the Indus to the Jhelum, from the Jhelum to the Chenab and from the Chenab to the canals now watered from the Ravi and the Sutlej.

If all goes well, the cultivators in the lower

In preparation of the land for irrigation, a heavy plank, the sohaga, *is widely used for levelling land and crushing clods.*

Transplanting rice seedlings ...ab. Th... mer crop in some areas but re...od sup... ing has also been used a... of rec...

Punjab, in Bahawalpur, and further downstream in Sind and Khairpur will be almost unaware of the great changes taking place above them. Perhaps they will notice a slight change in the colour or the taste of the water or even an increase in the amount carried by the distributary canal to the little channel which leads into their fields of cotton, rice, clover or sugar-cane.

Ali Mohammed is one such farmer who owns about 12½ acres of irrigated land in the Punjab in West Pakistan. Ali is fortunate—most of his neighbours are tenant farmers, many with little security of tenure at that. A holding of 12½ acres is common to this region; one half of a 25 acre block into which the modern canal colonies are divided for irrigation purposes. The farm entirely supports a large "family" consisting of the farmer, his wife and four children, two grandparents, and a younger brother and his wife and their two children. The "family" also includes a pair of draft bullocks, two milking buffalo cows, a herd of 11 goats and a small flock of chickens.

Only a system of double cropping, and the reliable crop yields which result from a naturally fertile soil and a well regulated canal irrigation system make this carrying capacity possible. There is, however, a wide variation in the kinds of irrigation, the size of holdings and the types and security of land tenure in this part of the world. Against our standard of living, the farmers of Pakistan and India rate poorly indeed, yet among his neighbours Ali Mohammed is well off in his

Intensive cropping on canal-irrigated lands. Most of the fields shown here are planted with corn and sugar-cane.

edlings ...ab. This is an important sum-
s but re...od supply of water. Rice grow-
used as ... of reclaiming saline soils.

After threshing by means of bullock or buffalo, the wheat is winnowed by tossing the grain and chaff with a wooden pitchfork.

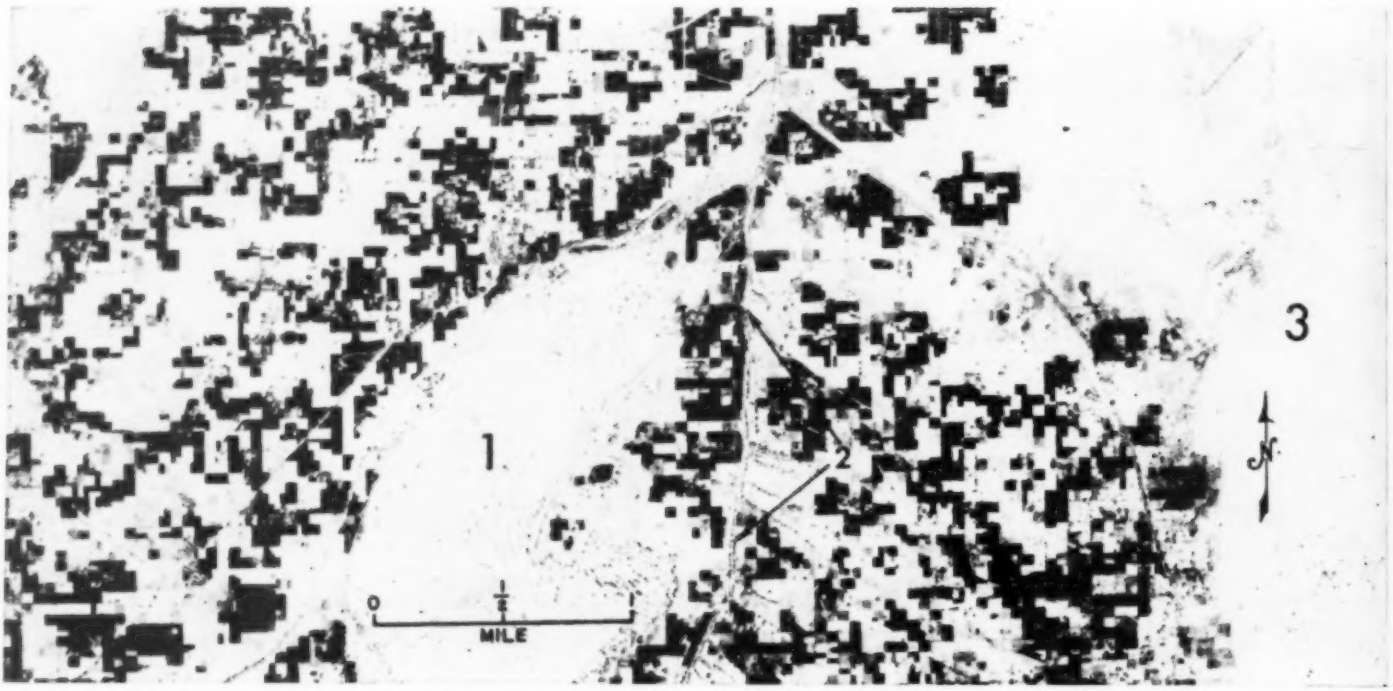
mud and wattle hut on one corner of a field on his own land.

In the *kharif* or summer season, this farm produces cotton, corn, sorghum or millet, other fodders, sugar-cane, some legumes such as kidney beans, and a few vegetables. In the *rabi* or winter season, it produces mainly wheat, sometimes barley, fodders such as clover, legumes such as gram (chick-pea) or oil-seeds of the mustard family such as rape. The sugar-cane which has a long growing season (almost a year) also occupies a few acres of land. Some fields are fallow as there is much less water in the winter period than in summer.

The work on the land never ceases the year round; there is no winter rest as we know it and some crops, mainly the oil-seeds, occupy an inter-season position in the cropping cycle. The harvest of one season's crop is barely finished before it is time to begin preparation of the soil for the sowing of the next.

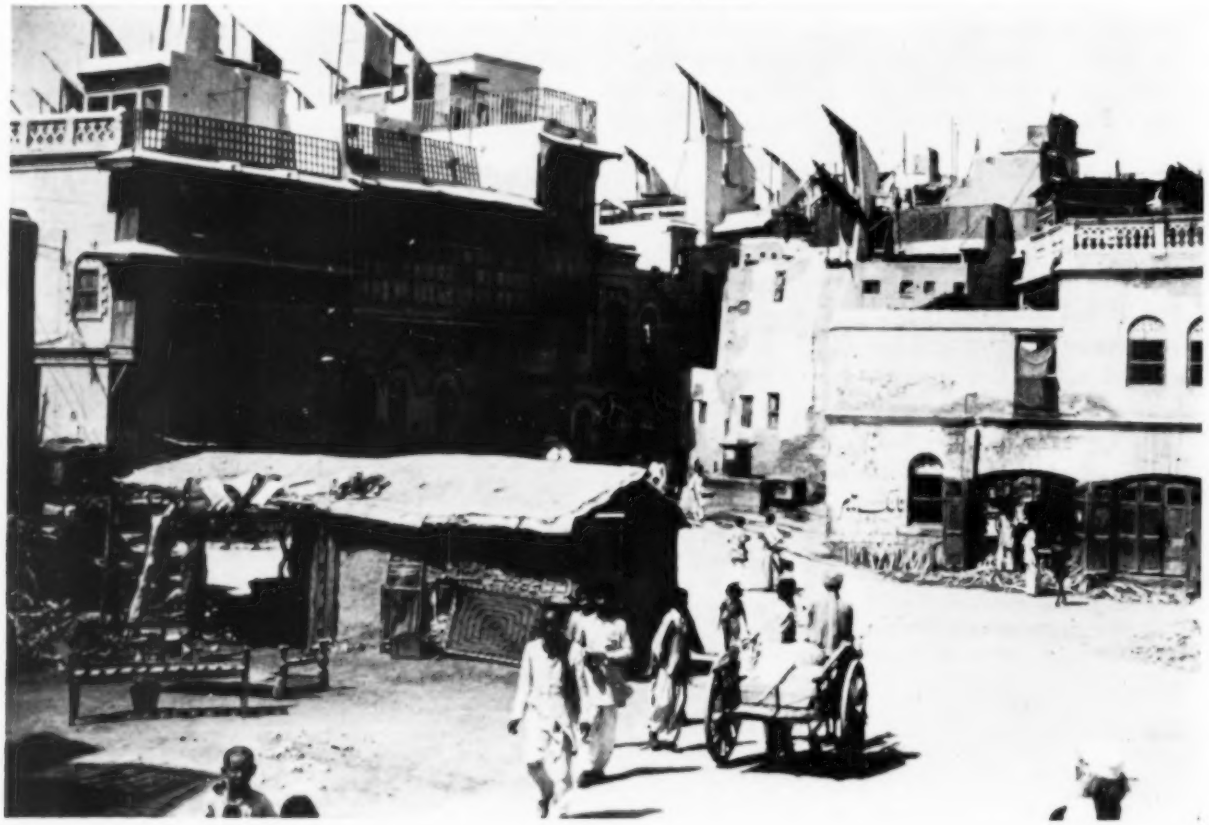
In the north near the foothills of the Himalayas, where the land is not irrigated there is sufficient rainfall for limited dry cropping of wheat and sorghum. Here a special crop rotation is required called "dofasli-dosala" (two seasons—two crops), which consists of the growing of a winter crop, usually wheat, followed by a summer crop, usually millet. After the autumn harvest the fields lie fallow for a full year and are ploughed several times to conserve moisture in the soil. The cropped fields and fallow fields are in large, separate blocks, each several hundred acres in area and the

Cleaning silt from the bed of a canal. Even the perennial canals are usually closed for a few weeks in mid-winter so that they can be cleaned.



This area in Bahawalpur was once part of the Thar or Great Indian Desert. It is irrigated from the Sutlej River, the waters of which are to be taken over by India. The huge carrier canals to be built on the Pakistan side of the border will maintain the supply of water to this thirsty land. Note the large patch of sand dunes (1) still remaining. The main canal (2) was once an inundation channel but is now part of a modern, controlled, non-perennial system. The edge of the Thar Desert appears at (3) ready to take back the cultivated land should irrigation fail. Hunting Survey Corporation

Hyderabad, Sind. In mid-day when the temperature passes 100 degrees the streets are largely deserted. The wind-catchers on the roofs deflect the monsoon breeze down into the buildings which are crowded tightly together.



cultivation of the land in this well organized fashion is done on a village basis. But dependence on rainfall is fraught with hazard because the reliability of the precipitation is low. Irrigation is, of course, the only answer, and irrigation requires water.

Probably three-quarters of the forty million people of West Pakistan depend upon the waters of the Indus River system for their very life, for without irrigation the face of this country would revert to the sandy waste of a sterile desert. This is a harsh environment where even with irrigation the struggle for existence is a day to day reality. The natural rainfall ranges from about 20 inches per annum in the north to five inches in the central regions and to 10 inches near the Arabian Sea. But equally limiting with the quantity of rain is the variability—many months can pass by without a single shower.

On the other side of the ledger, however, is the presence of vast level acres of fertile soil, which after plowing, levelling, embanking and watering produce crop after crop for seemingly endless years with little or no fertilizing. This alluvial plain of 100,000 square miles is blessed with almost ideal soils for irrigation farming. Traditionally, and for many centuries, the industrious and able Punjabi farmers of Moslem, Sikh, and Hindu faiths have drawn on the Indus waters and turned their land into what was called the "breadbasket of India".

When the international agreements and financial plans are completed, it will then be up to the engineers to bring this $1,000 million scheme to fruition so that Ali Mohammed and his neighbours may continue to receive uninterrupted and undiminished, the life-giving waters of the mighty Indus.

During low water on the Indus River, local ferries carry goods and animals as well as people. During high water only steam-driven ferry boats can ply the swirling waters in safety.

George Calvert, Lord Baltimore. From an engraving in the Public Archives of Canada.

Public Archives

In Quest of Lord Baltimore's House at Ferryland

by J. R. HARPER

Photographs by the author except where credited.

THE PICTURESQUE outport of Ferryland, Newfoundland, lies half down the Avalon Peninsula's east coast. It has lived for cod fishing since the days of Henry VII. Dories and larger boats depart each morning and return each evening with a gleaming silver harvest. Day and night the summer air is laden with the odour of salted cod drying on the inner harbour's stone shingles or on more distant stages. Eventually the cod will find its way to markets in Europe, the West Indies and great cities of the American sea board. Such has been life in Ferryland for four and a half centuries, but superimposed on this daily routine are innumerable romantic tales. These tell of lords and ladies, of privateers, pirates and freebooters, and of English soldiers defending the outposts of empire against the French and Dutch. Stories centering around the first Lord Baltimore seem to take historical precedence in a colourful mosaic. The writer on behalf of the Historic Sites Division of the Department of Northern Affairs, and assisted by Charles Grant, spent a week during 1959 searching for and digging to verify archaeologically the site where Baltimore's house stood in Newfoundland.

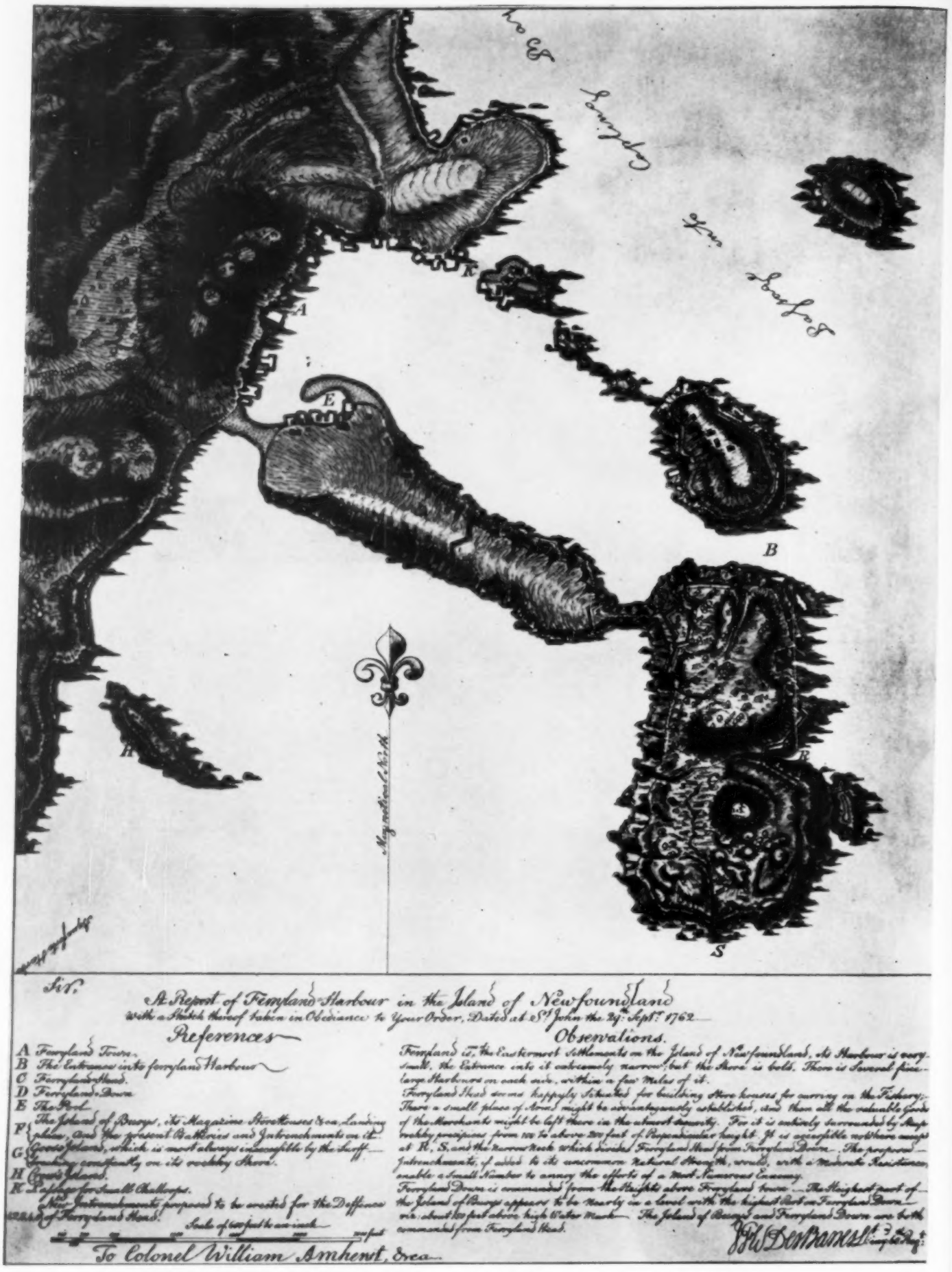
George Calvert, Lord Baltimore, youthful Secretary of State to James I, was filled with that same pioneering spirit which made the first Elizabethan age a glorious era in English history. He had visions of empire beyond the seas; in fulfillment of these dreams, James granted Baltimore palatine rights on the Avalon Peninsula. The noble lord thus became virtual monarch, subject to loose allegiance to the British Crown, of a little independent kingdom which even issued its own coinage. Many years ago a single Avalon coin was found, curiously enough, in Waterville, Maine. Baltimore sent Captains Ed-

ward Wynne and Daniel Powell with a group of West Country and Welsh settlers to Ferryland in 1621. Here they undertook to build a capital. To-day you will find a distinctive brogue in the village; it may have had its beginning at that time. At least one present resident claims ancestry in one of Wynne's men. Wynne's first task was the construction of a large house. Some other buildings were added until there was a whole village street. These included a brew house, salt works, forge, structures connected with fishing, and settlers' houses. All were built of lumber cut in near-by woods. The men dug a well, planted a garden, and sowed a field of grain during that first year. Potatoes, virtually unknown to Englishmen at that time, were not listed in Wynne's planting, but they are now a principal garden crop in Ferryland. Farm animals were kept on the peninsula, and protection was afforded against marauding animals on the very narrow isthmus which connects it to the mainland.

We are told that Wynne built a substantial manor house and that it was then possibly the largest house north of Mexico. Baltimore didn't occupy it until July, 1627, when he came for a short visit. He must have been impressed with the prospect for he returned the following year with his wife and all of their children except the eldest son. They repulsed French privateers during the winter and found, in addition, that the rigours of the climate were very different from the optimistic tales of the chronicler Whitbourne who had described it as a semi-tropical Utopia. The winter was too much for Lady Baltimore's delicate health and the entire family departed the following autumn for Jamestown, Virginia. They stayed at that place until a few months after the first Lord Baltimore's death in 1632 when under a charter from Charles I, his eldest son founded the colony of Maryland.

The Baltimores never returned to their palatine of Avalon, Newfoundland, but a governor was left in charge. A story, apocraphyl or otherwise, states that the manor house was repaired and enlarged some time before 1649 on instructions of the Baltimore

The inner harbour of Ferryland. An arrow indicates diggings where Baltimore period house remains were found beside the present Sullivan house and at the foot of an easy ascending hill. To the right is the peninsula giving access to the mainland, and in the foreground cod fish are still cured on the stoney beaches.



Sir.

A Report of Ferryland Harbour in the Island of Newfoundland

With a Sketch thereof taken in Obedience to Your Order, Dated at St. John the 29th Sept.r 1762

References

A Ferryland Towne.
B The Entrance into ferryland Harbour
C Ferryland Head.
D Ferryland Downs
E The Road
F The Island of Bourge, its Magazine Storehouses &c.a Landing place, And the present Batteries and Intrenchments on it.
G Goats Island, which is most always inaccessible by the Surff breaking constantly on its rocky Shore.
H Green Island.
K Passage for Small Craft.

New Intrenchments prepared to be erected for the Defence of Ferryland Head.

Observations.

Ferryland is the Eastermost Settlements on the Island of Newfoundland. Its Harbour is very small. the Entrance into it extremely narrow, but the Shore is bold. There is Several fine large Harbours on each side, within a few Miles of it.

Ferryland Head seems happyly Situated for building Store houses for carrying on the Fishery. There a small place of Arms might be advantageously established, and then all the valuable Goods of the Merchants might be left there in the utmost Security. For it is entirely surrounded by Steep craggy precipices from 100 to above 200 feet of Perpendicular height. It is impossible anywhere except at R, S, and the narrow Neck which Divides Ferryland Head from Ferryland Downs. The proposed Intrenchments, of added to its uncommon Natural Strength, would, with a Moderate Assistance, enable a Small Number to annoy the efforts of a Most Numerous Enemy.

Ferryland Downs is commanded from the Heights above Ferryland towne. The Highest part of the Island of Bourge appears to be nearly on a Level with the highest Part on Ferryland Downs, or about 80 feet above high Water Mark. The Island of Bourge and Ferryland Downs are both commanded from Ferryland Head.

J.Ph.S. DesBarres Lt. 3d Regt. Engr.

Des Barres' map of Ferryland, prepared in 1762 during the Seven Years' War.

Public Archives

family who were ardent Roman Catholics and Royalists. They proposed that Charles I in his losing fight with Parliament, should abdicate and use Ferryland as an exile retreat; he turned down the offer, evidently preferring to stay in England and lose both his crown and head to asylum in Newfoundland without the crown. Ferryland was granted to Sir David Kirke in 1637. He had conquered Champlain's New France a few years before and the grant is said to have been in compensation for his surrender of Quebec on resumption of peace with France. Kirke lived in the manor house; after his death, his sons George, Daniel and Philip were leaders in Ferryland until at least 1660. Then the colony suffered reverses from raids by Dutch, pirates and freebooters operating on the known world's fringes. The manor house fell into decay, although the village was never completely deserted.

Edward Wynne wrote a letter to England dated in July, 1622, which describes the building of Baltimore's manor house. Part of it is as follows:

> Notwithstanding our diligent labour and extraordinary paines-taking, it was Alhallowtide before our first range of building was fitted for an habitable being. The which being 44 foot of length and 15 foot of breadth containing a hall 18 foot long, an entry of 6 foot, and a cellar of 20 foot in length, and of the height between the ground floor and that overhead about 8 foot being devided above, that thorowout into foure chambers and foure foot high to the roofe or a halfe storie. The roofe over the hall I covered with Deale boords and the rest with such thatch as I found growing hereabouts the Harbour, as sedge flagges and rushes, a far better covering than boords, both for warmth and titeness. When I had finished the same with onely one Chimney of stoneworke in the Hall, I went forward with our Kitchen of Length 18 foot, 12 foot of breadth, and 8 foot high to the eves, and walled up with stoneworke with a large chimney in the same. Over the kitchen I fitted another Chamber. All which with a staire case and convenient passages both into the Kitchen and the roome over it, were all finished by Christmas eve. This is all the building with a hen house that we have been able to accomplish before Christmas.

This is evidently the four-gabled house pictured on Fitz-Hugh's map of Ferryland dated 1693, although by the time of the map the house was probably already in decay.

Captain Powell adds specific details as to the building's location. His letter written to Lord Baltimore in the same month as Wynne's, reads:

> The land whereon our Governour hath planted, is so good and commodious, that for the quantity, I think there is no better in many parts of England. His house which is strong and well contrived, standeth very warme, at the foot of an easie ascending hill on the south east and defended with a hill, standing on the further side of the Haven in the North West. The beach in the north and south sides of the land locke it, and the seas on both sides are so neare and indifferent to it, that one may shoot a Bird's bolt into either sea. No cold can offend it, although it be accounted the coldest harbour in the Land, and the seas do make the land behind it to the South-East being neere 1000 acres of good ground for Hay, feeding of cattel, and plenty of wood, almost an Iland, safe to keepe anything from ravenous Beasts.

This letter when examined in relation to the Ferryland topography, identifies most precisely the manor house's location. Ferryland peninsula, a double-bulging appendage, is connected to the mainland by a narrow isthmus. A towering craggy hill on the mainland, certainly the one referred to by Powell, overlooks the peninsula on the north-west. Both fishermen and such legendary characters as Peter Easton, the Pirate, used it as a lookout from which warning was signalled to the village of approaching privateers or King's men who threatened to land. The peninsula "Downs" slopes from the south-east toward the isthmus with a sheltered shoreline between the toe of the hill and the inner haven of Ferryland harbour. Making allowance for certain shore-line erosion throughout the years, and after examination of various suggested sites, there seems to be one possible spot, and only one, where the

Ferryland, looking toward the main settlement from the isthmus. In the foreground, fishermen catch caplin with dip nets. Canada Dept. of Fisheries

house could have been built. Mr. David Sullivan's lot just to the east of the isthmus, fits the described contours in every way, and is a "bird bolt" shot from either shore. Unfortunately, serious difficulties for archaeological confirmation were posed by this location. Sheriff Carter, a local 18th century potentate, had built in this ideal location and he may even have used the cellar of the Baltimore house. More recently a house was built over the Carter house cellar depression. The whole surface of the surrounding lot was raised by rock fill of up to four feet thick as a base for a grassy terrace; the rock strata filled in was an impenetrable barrier for a small crew to penetrate in the available time. However just to the east in the adjoining lot there was a low spot without fill. We determined on digging there hoping some traces of the Baltimore house would extend into

Looking toward the peninsula, where farm animals of Wynne's settlement were kept. Canada Dept. of Fisheries

that area, or at least that we might find some articles of the early 17th century beneath the surface.

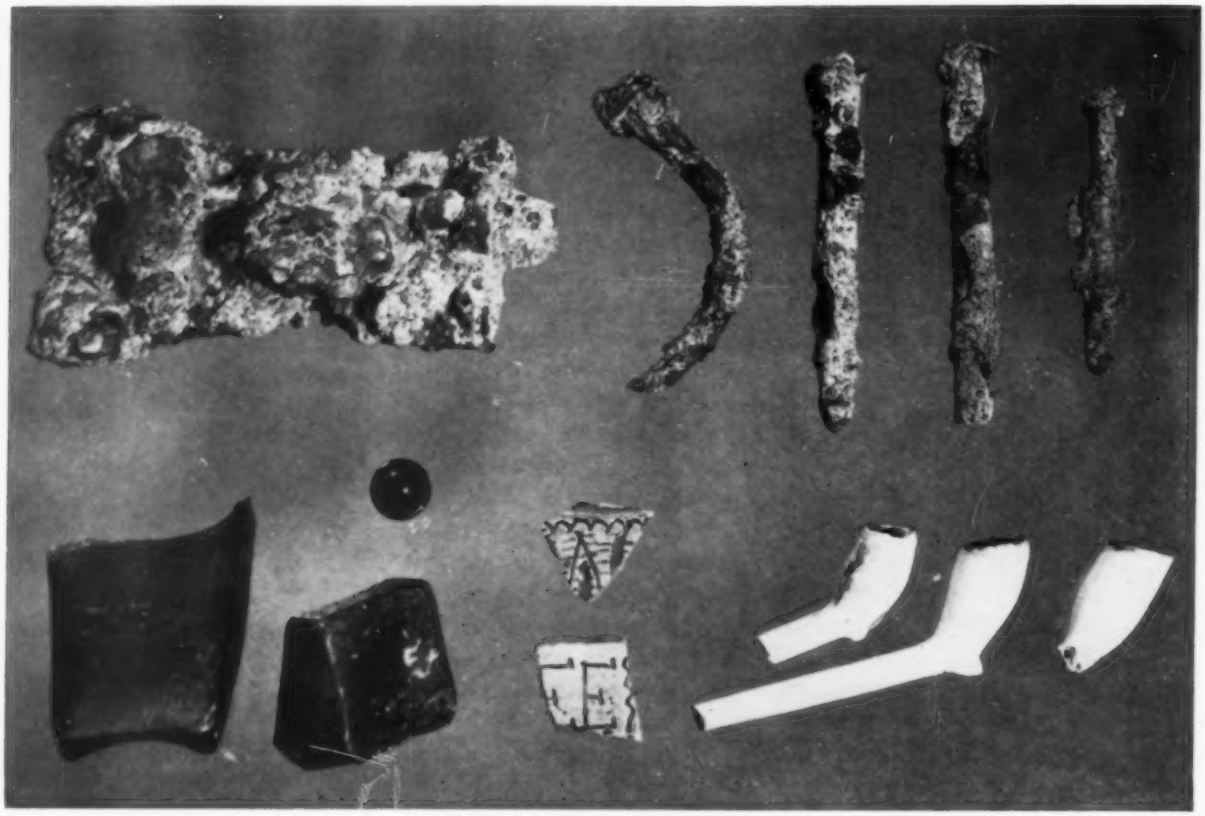
Two days were spent in excavating a six foot square hole. Results were significant. Less than a foot beneath the surface a dark line marks where there had been the ground surface with growing grass at some previous date. Soil above this line was deposited during the last half century or century; it contained miscellaneous dish and glass bottle fragments, not older than the Victorian age. On the other hand, quite different articles lay at and just below the old grass line. There were fragments of broken gray stoneware dishes like those used by Wolfe's army, squat round dark green wine bottles, and white clay pipes of the Seven Years' War period. They belong to an era of great activity in Ferryland. Two dozen cannon still lie rusting on Buoy's Island at the outer harbour entrance where British garrisons defended Newfoundland against the French. The famous cartographer, J. J. W. Des Barres, prepared a 1762 plan showing buildings skirting the inner harbour not far from where we were digging. Garbage from these buildings had been strewn on the surface, then a foot lower than the present ground level.

Digging was continued to a depth of about two and a half feet when undisturbed gravel beds were reached. Just above the gravel layer was a second dark humus line which was the surface at an early date. Several objects of considerable importance were recovered from this early stratum. Numerous rusted hand-made nails lay in crumbling shreds of wood. An early form of door lock was with them. A wooden building stood here well before the 1750's to which date the upper ground level had been assigned. It had collapsed and rotted away. Fortunately, critical dating criterion was found in association with the rotted wood. Two pieces of "sgraffito ware", a green glazed earthenware with a peculiar incised type of decoration, were unearthed; this pottery was made in Devonshire about 1650. Identical types of dishes were found in colonial Jamestown in Virginia and its identification is unmistakable. Then there were several fragments of high square gin bottles made of bubbly green glass fired at a low temperature. Again, similar bottles were found in Jamestown, and have been traced to a date before 1650; they are a marked contrast in type to those of the 18th century found higher up. An acorn-shaped kaolin pipe bowl set at a decided obtuse angle to its stem and with a coarse bore is of mid-17th century date; it is very different to the thinner more open bowl stamped with a crown and "ER" of 18th century British army issue from the upper levels. The evidence points to a wooden building collapsing here sometime about the mid-17th century. There seems little doubt that this was a wing or outbuilding of the main Baltimore house just to the west. To have found the actual foundations of stone walls or chimneys as described by Wynne, or even one of the "Avalon" coins, would have given great satisfaction, but the location of the building seemed sufficiently proved under all the circumstances.

A final object recovered among the debris of the collapsed building should be mentioned. It was a large green glass alley, crudely made, and probably of little real significance. This was what a child might have played with. A romantic might link it with the toys of Baltimore's young son who spent the bleak 1628-9 winter near this spot in Ferryland.

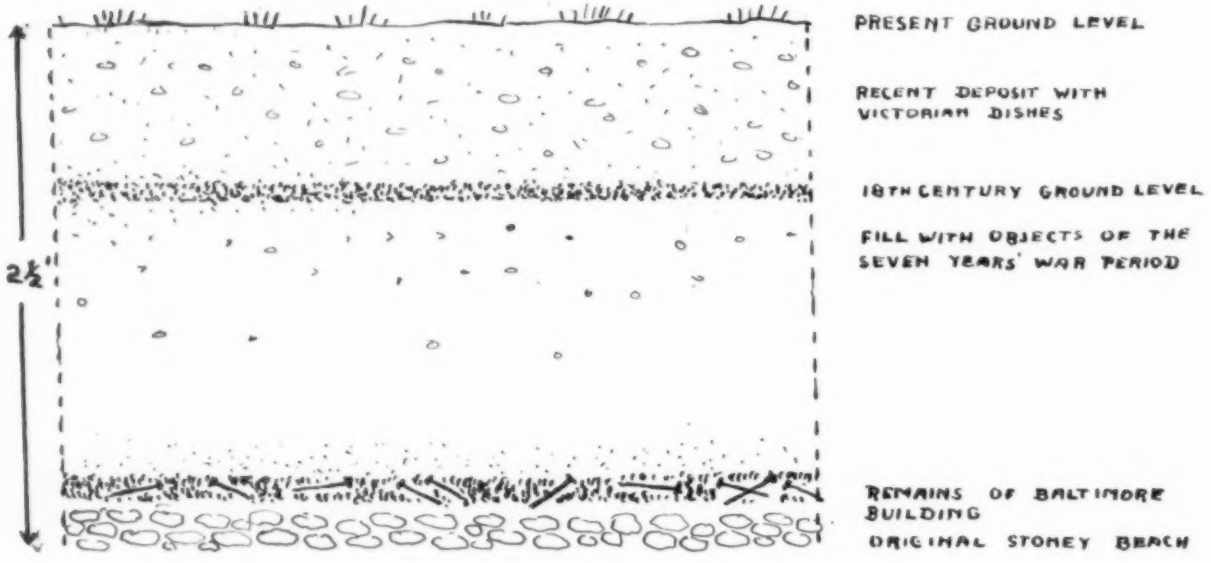
Several additional days were spent investigating other suggested house sites and remains about Ferryland. Negative results strengthened the belief that the correct one was already located. Faint remains of a build-

Traces of cobbling which traditionally was laid down by Baltimore's men in the early 17th Century, can still be seen in Ferryland.



Articles excavated at Ferryland
Top row: lock and four nails from a house of the time of Baltimore. Lower row: two fragments of a gin bottle of ca. 1625; a glass marble; two fragments of 17th Century sgraffito ware; a mid-17th Century pipe; a pipe of ca. 1700; and a pipe of ca. 1750.

Schematic plan showing the various strata in the ground where the Baltimore house stood.


PRESENT GROUND LEVEL
RECENT DEPOSIT WITH VICTORIAN DISHES
18TH CENTURY GROUND LEVEL
FILL WITH OBJECTS OF THE SEVEN YEARS' WAR PERIOD
2½'
REMAINS OF BALTIMORE BUILDING
ORIGINAL STONEY BEACH

ing on the inner harbour shore line yielded white salt glaze plates and mugs, and a fragment of gray stoneware embossed with the lion and unicorn. They can be matched by material found at Louisbourg dating from 1758, and the building was evidently one of those marked on the Des Barres plan. Another foundation out on the "Downs" is where Maryland excavators are said to have found clear evidence of Baltimore's house. We found a "TD" pipe and a "Patented" British army button bearing the Royal arms of a 19th century type, and some fragments of Victorian dishes. This was probably the "Downs House" where the grandmother of Howard Morry, Ferryland's local patriarch, had partied in her younger days. So it was in all other building remains with no direct link to Baltimore's day being uncovered. We were shown a well filled in after the drowning of a child which may have been that dug by Wynne and Powell, but a complete excavation would be necessary to prove it. A stone wall with early dish fragments nearby was possibly the buttment of an early quay, but whether built by Baltimore's men is questionable.

Finally a word should be added about one other visible link with the past. Curious cobbled streets were noted at various points throughout the village, although large sections had been dug up in living memory. They were too rough for trundling of wheelbarrows. Superficially at least this resembles the cobbled streets of Dartmouth and other Devon villages. Local tradition says the cobbles were laid by Wynne and his helpers in Baltimore's day. Possibly they were, but they might just as readily date from the late 18th century resurgence of Ferryland for they seem on a higher relative level than the Baltimore house remains. They symbolize, however, the many unclarified links with the past in this, one of Canada's most historic settlements, where the ties with European civilization go back further than in almost any other spot on the American continent.

Fishermen at Ferryland forking out the day's catch of cod, a routine which has been carried on here daily with but little variation for nearly four and a half centuries.

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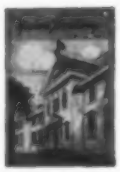

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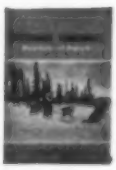

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EDITOR'S NOTE BOOK

Mark Ronayne (*Teeming Waters*) was born in St. John's, Newfoundland, and spent eleven years in almost every category in newspaper work before joining the Department of Fisheries of Canada as Chief of the Information Branch for the Newfoundland Area in 1953. He was transferred to Ottawa in 1956, and was appointed Assistant Director of the Information and Educational Services of the department in 1958.

* * *

R. C. Hodges (*Indus Water For Pakistan*) was born in England, and received his education in Toronto. He is a graduate of the University of Western Ontario, and did post-graduate studies at Toronto, specializing in geography.

Mr. Hodges spent three seasons with the Ontario Department of Planning and Development (Soil Conservation Surveys) followed by five years as secretary and consultant to the Humber Valley Conservation Authority. Mr. Hodges joined the Hunting Survey Corporation in 1953 to conduct the Colombo Plan Soil and Land Use Survey of

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September is the "back to school" month when students begin to think not only of text-books but also of more general reading that will broaden their knowledge or provide reference material for special projects. The *Canadian Geographical Journal* can help fill this need. If you have found it useful in this way in your own home you might tell your friends who have school-age children so that they too may become members of the Society. Or, nominate them for membership and we will be pleased to send them further information about the Society and about the *Canadian Geographical Journal.*

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West Pakistan. After a period in Canada he returned to the East in 1956 as field survey chief and later project manager of the Aerial Resources Survey of Ceylon. He recently completed an assignment in Peru as consultant to the Minister of Development and Public Works of that country to advise on the colonization prospects and resource potential of a large region in the foothills of the eastern Andes.

* * *

J. R. Harper (*In Quest of Lord Baltimore's House at Ferryland*) was recently appointed Curator of Canadian Art at the National Gallery of Canada. Previously, he has been on the staffs of various Canadian museums and directed, among others, the excavation of Fort La Tour in Saint John, New Brunswick, and Louisbourg, Nova Scotia. He spent two years in Europe doing research on early Canadian material in Paris, London and other centres on a Royal Society of Canada Fellowship from 1956 to 1958.

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AMONGST THE NEW BOOKS

Surveyor of the Sea

by Bern Anderson

(University of Toronto Press, Toronto. 274 pp. $6.75)

The name of the hero of this book can never be forgotten by Canadians as long as the largest island and the largest city, on our west coast, continue to be named for him. But the reminders of the work which he did and the conditions under which he did it, are not so frequent. Because of its historical and political implications, Vancouver's expedition is perhaps best remembered as having been despatched to receive the British territory taken by the Spaniards at Nootka Sound in 1789. But the original instructions (which are given in full as an appendix to the book) give as the "first object" for despatching the *Discovery* and the *Chatham*, the acquisition of "a more complete knowledge, than had yet been obtained, of the northwest coast of America", including the search for a Northwest Passage. Vancouver's plan was to start his survey at a point known to be on the continent and to follow the shore line. This he did with meticulous attention to detail, all of which he carefully recorded so as to make "the history of [his] transactions . . . as conclusive as possible, against all speculative opinions respecting the existence of a hyperborean or mediterranean ocean within the limits of [his] survey". The maps and charts which resulted have been recognized by later surveyors and hydrographers as works of great magnitude. For almost a century after his death they were still the most trustworthy authority for much of the coast. The marvel is all the greater when one reads of the hardships and problems which Vancouver had to face — of the occasion when many of his men became sick and one died, through eating mussels; of skirmishes with Indians; of trouble with scurvy; of temperatures *in the cabin* of 7°F., and of personal suffering, probably through a hyperthyroid condition.

One senses in Bern Anderson's pages the monotony of much of the life (Vancouver was nearly five years away from home), but he also vividly

(*Continued on next page*)

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describes the breaks in the monotony, such as the hospitality and friendliness of the Spaniards, particularly Quadra, and the visits to Monterey and to the Hawaiian Islands. Indeed, it was at Hawaii that Vancouver demonstrated no mean skill as a diplomat by endeavouring to bring about peace between the native chiefs and by negotiating the cession of the islands to the United Kingdom. Vancouver left as indelible a mark on the future of Hawaii as he did on Northwestern America. Yet he died obscurely at the relatively early age of forty-one, eight months after the Admiralty paid him for the six years of service from 1791 to 1797, but before the sixth volume of his *Voyage of Discovery to the North Pacific Ocean and Round the World* was completed. That his death was almost unnoticed was partly due to the preoccupation of the United Kingdom with the war with France. But Vancouver's achievements were overshadowed by the popular admiration for Cook, and his reputation was questioned because of the disciplinary measures he took against a member of his crew who happened to have powerful family connections, and because of the criticism of Sir Joseph Banks, who happened to dislike him.

In this book we have a modern-day naval officer's tribute to the quiet tenacity of this eighteenth-century civil servant in uniform. It is absorbingly written, and well authenticated and should, at least convince any sceptics that Vancouver's name fully deserves to figure so prominently on the map of Canada.

N. L. NICHOLSON

Dr. Nicholson is Director of the Geographical Branch of the Department of Mines and Technical Surveys at Ottawa.

* * *

Wilfred Grenfell
by J. Lennox Kerr
(The Ryerson Press, Toronto.
272 pp. $4.00)

Mr. Kerr has written a most readable book. Accurate in its factual aspects, the physical and historical backgrounds together form a vivid and detailed framework for a well rounded portrait of a most remarkable man who in his lifetime exemplified the old Christian precept "love thy neighbour".

In the early chapters great care has been taken to ensure that the reader appreciates the forces of heredity and precept which helped to shape the character and mentality of the young Wilfred Grenfell.

Dr. Grenfell's apprenticeship with the North Sea fishermen has been well covered and is in itself a fascinating story, throwing a good deal of light on the activities of a little known organization that perhaps deserves a book of its own.

In the later chapters the author has succeeded in conveying a picture of conditions in Labrador which is not one whit exaggerated. When Sir Wilfred first saw them the people on this rocky coast did indeed exist under a system of material serfdom in conditions of appalling misery and degradation which defies imagination.

The good Doctor is shown tackling this stagnant pit with stubborn energy, courage and Christian faith, confounding lesser men and frustrating the efforts of his enemies to bring him down.

Mr. Kerr makes it quite plain however that Wilfred Grenfell was no saint, these greater qualities of his were underscored by lesser ones. His co-workers and friends were frequently disconcerted, exasperated, embarrassed and sometimes reduced to incoherence by the good Doctor's lack of judgment, his tendency to embroider the truth — though he scorned to lie — and the fact that he was unable to see anyone else's point of view.

However, considered as a whole Mr. Kerr has written the story of a great and good man who rightly earned the love and gratitude of those for whom he did so much.

For my own satisfaction I should like to correct the author on one minor detail. The meaning of the word 'auksheni' is *not* 'good-bye'. The word is used both as a greeting and a farewell and means "be strong".

L. W. BUDGELL

Mr. Budgell works in the Department of Northern Affairs at Ottawa.

* * *

The Earth Beneath the Sea
by Francis P. Shepard
(Johns Hopkins Press, Baltimore.
275 pp. $5.00)

To the rapidly growing list of first-class books on the sea may be added Shepard's recent and very readable account of the ocean floor. His scope is broad, ranging bathymetrically from the tide lines down to the greatest known depths, geographically the

(Continued on page IX)

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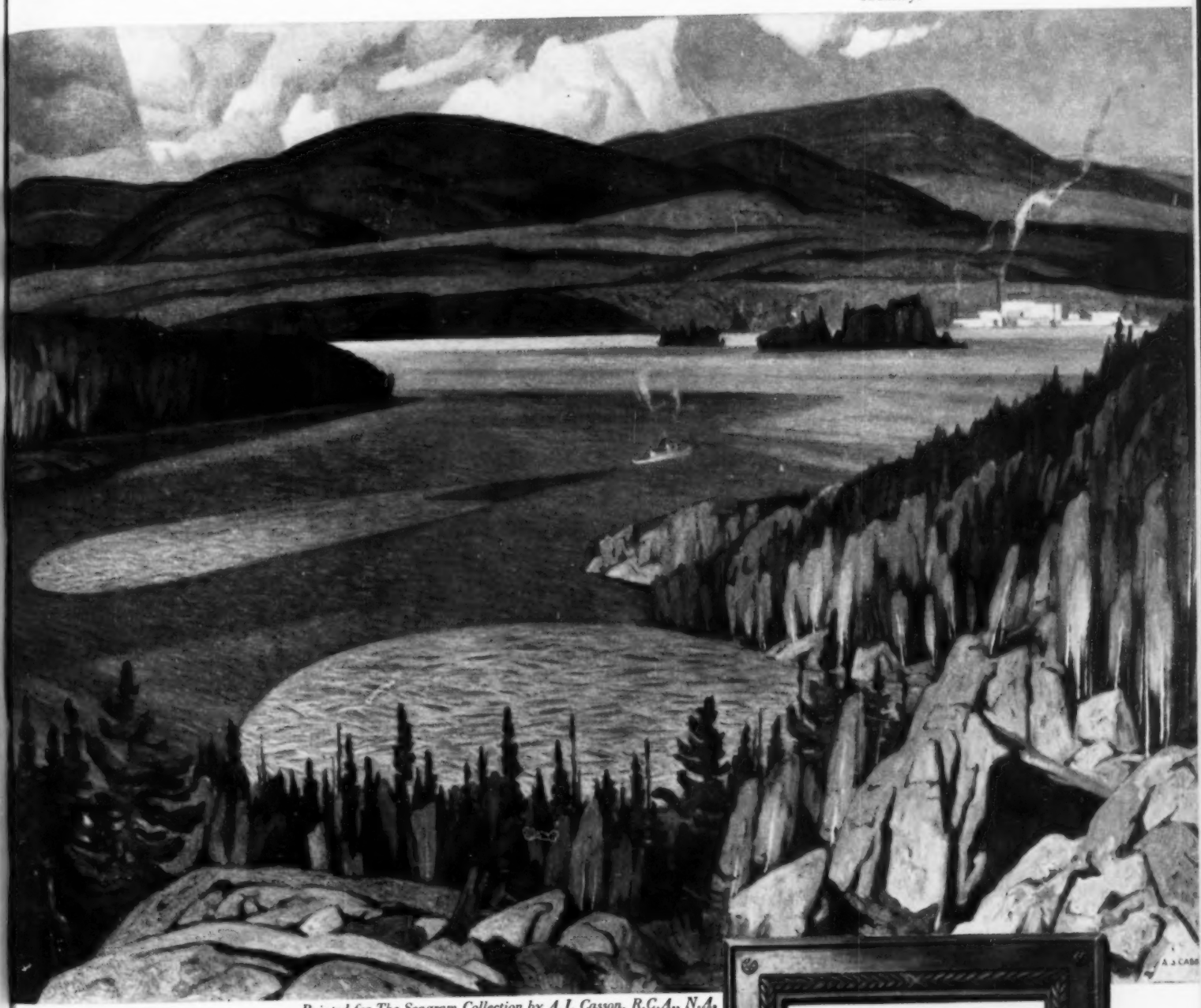

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world over, and geologically from the earliest fossil-bearing strata to post-glacial submarine deposits. Nevertheless his treatment is compact and clear, with detail sufficient to intrigue but not confuse the reader.

The book is concerned principally with the continental shelves and with the physical factors that determine their origin, configuration, transformation, and present depth. Herein we find plausible answers to questions that have plagued submarine geologists for years, for instance, the origin of submarine canyons on continental slopes, the origin and mode of transport of coarse sediments on the deep ocean floor, and the origin of coral atolls and barrier reefs. The casual seashore observer will learn, for various types of coast, the origin and eventual disposition of beach materials, and how shore features like cusps and ripple marks are formed. Skin divers will find useful advice on exploring the shallows effectively and safely. The book also contains practical considerations for buyers of shore-line property.

A publication dealing essentially with physical and mathematical problems of the sea floor might ordinarily be "heavy going" for the layman, but this account is enlivened by incidents from the author's life-long experience in the field, and by frequent reference to biological aspects of the environment (corals, fishes, indicator fossils). Shepard's work contains the very latest information on the subject, interestingly and lucidly presented, generously illustrated, on good quality paper, and at modest price; for these reasons it should be found on the bookshelf of everyone who finds enjoyment in learning about the sea.

E. L. BOUSFIELD

Dr. Bousfield is curator of Invertebrate Zoology at the National Museum, Ottawa.

* * *

A Commercial Geography
by L. Dudley Stamp

(Longmans, Green and Company, Toronto, 453 pp. $2.55)

A Commercial Geography is the seventh edition of the book, first published in 1936. Originally written as the result of years of lecturing to local branches of the British Institute of Bankers, it was intended to

monstrate the author's point of view that "geography must be a key subject" because of "the interdependence of all parts of the modern world". The general plan and aim of the edition remains unaltered, although the text, statistics and diagrams have been carefully revised to bring them in line with recent developments.

N. L. NICHOLSON

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Venture to the Arctic
Edited by R. A. Hamilton
(The Penguin Books, Baltimore, U.S.A. 283 pp. 95c).

The British North Greenland Expedition, whose work this book describes, was conceived, planned and led as a naval expedition by Commander (L.) C. J. W. Simpson, R.N., who "well knew the great part the British Navy had played in the Arctic exploration of the nineteenth century, and . . . wanted to revive and foster experience and the polar perspective in the Navy." After a reconnaissance by a small naval party in 1951, the expedition of twenty-five men left England in July 1952 in a Norwegian sealing-ship, and spent the next two years carrying out scientific work from a base in Dronning Louise Land in north-east Greenland and from a station near the centre of the northern part of the ice cap. The scientific work was the responsibility of university graduates, who were assisted by service officers; Mr. Hamilton, a meteorologist, was the chief scientist as well as second-in-command of the expedition. Most of the technical duties were undertaken by service officers, petty officers and N.C.O.'s. Five additional members joined the expedition in 1953 to replace those who were only spending one year. Royal Air Force flying-boats played an essential part in the initial supply, resupply and final evacuation of the main base on Britannia So; and airdrops by the R.A.F. made possible the establishment of the ice cap station.

It is customary for the leader of a large expedition to present the public with a popular account of the exploits of his party; Commander Simpson has already done this in his book "North Ice". However, such an expedition should be judged on the quality of its scientific results, which are usually published in the appropriate journals or in a special series of reports; in neither case are they readily available or even particularly intelligible to the general public. Short, scientific appendices are sometimes added to the popular, generally expensive, book on the expedition, but here for the first time the scientific achievements of an expedition are presented in a well-produced and well-illustrated book at a price well within the purse of everyone. The book includes accounts of previous exploration and research in north-east Greenland, and of the background of the expedition; and a chapter on the difficult but unspectacular tasks of raising funds and of arranging for the preparation of reports. The scientific chapters are written lucidly with a minimum of jargon, a sure sign that the authors are thoroughly conversant with their subjects. The authors are: Lt. Cmdr. F. R. Brooke on survey, Mr. Hamilton on meteorology, Dr. C. B. B. Bull on gravity and seismic investigations on the ice cap, Drs. H. E. Lewis and J. P. Masterton on medical aspects and physiology, Dr. H. Lister on glaciology, Mr. J. D. Peacock on geology, and Mr. P. J. Wyllie on geomorphology; each has given an account of how the work was done and some of the results. There is an impressive bibliography of the scientific papers published to date, and a good index. This joint publication deserves to be read by a wide public.

G. HATTERSLEY-SMITH

Dr. Hattersley-Smith works on the National Defence Research Board and was leader of the Canadian IGY expedition to Ellesmere Island.

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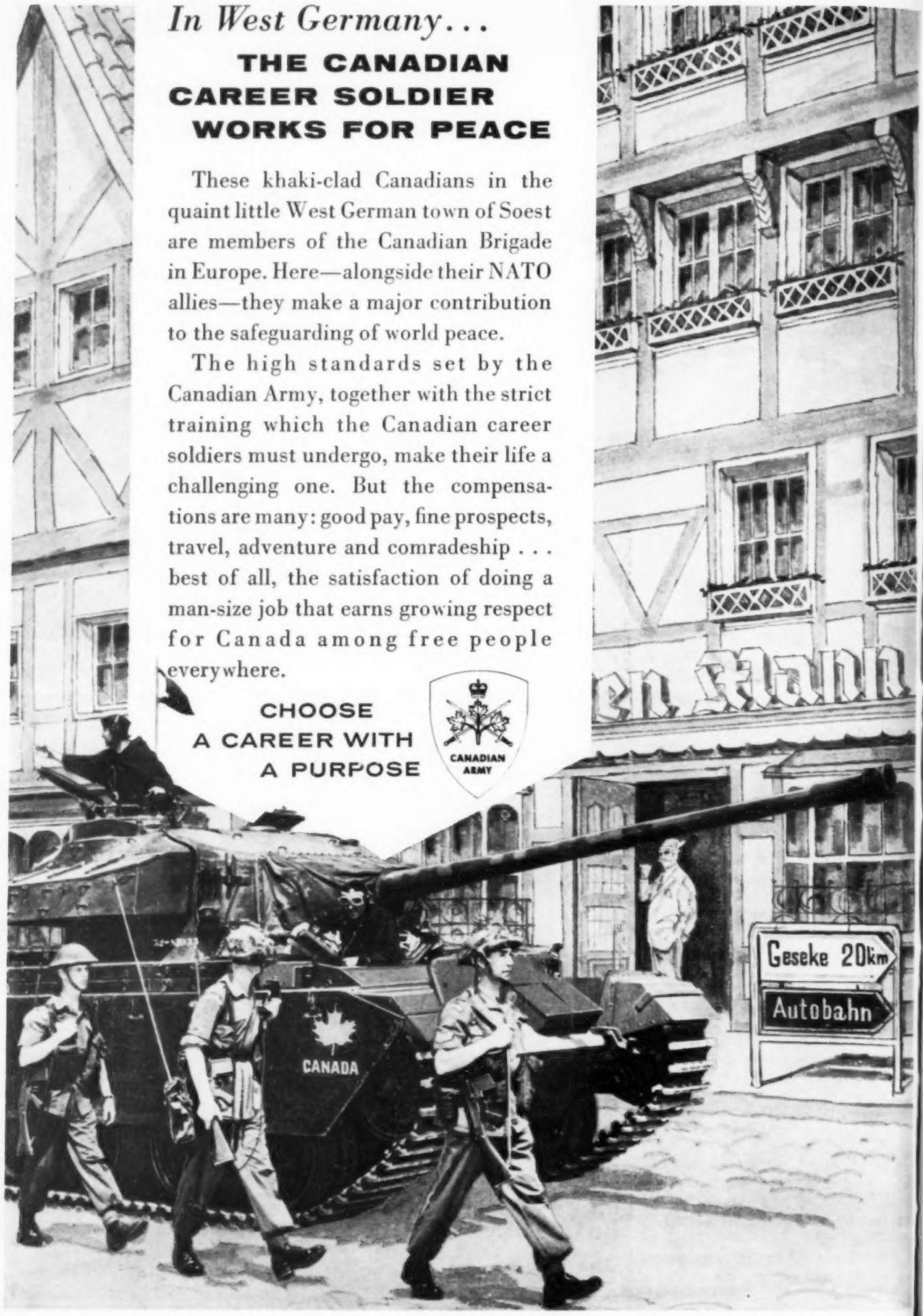
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